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Your COMMODORE

YOUR BEST INDEPENDENT COMMODORE MAGAZINE



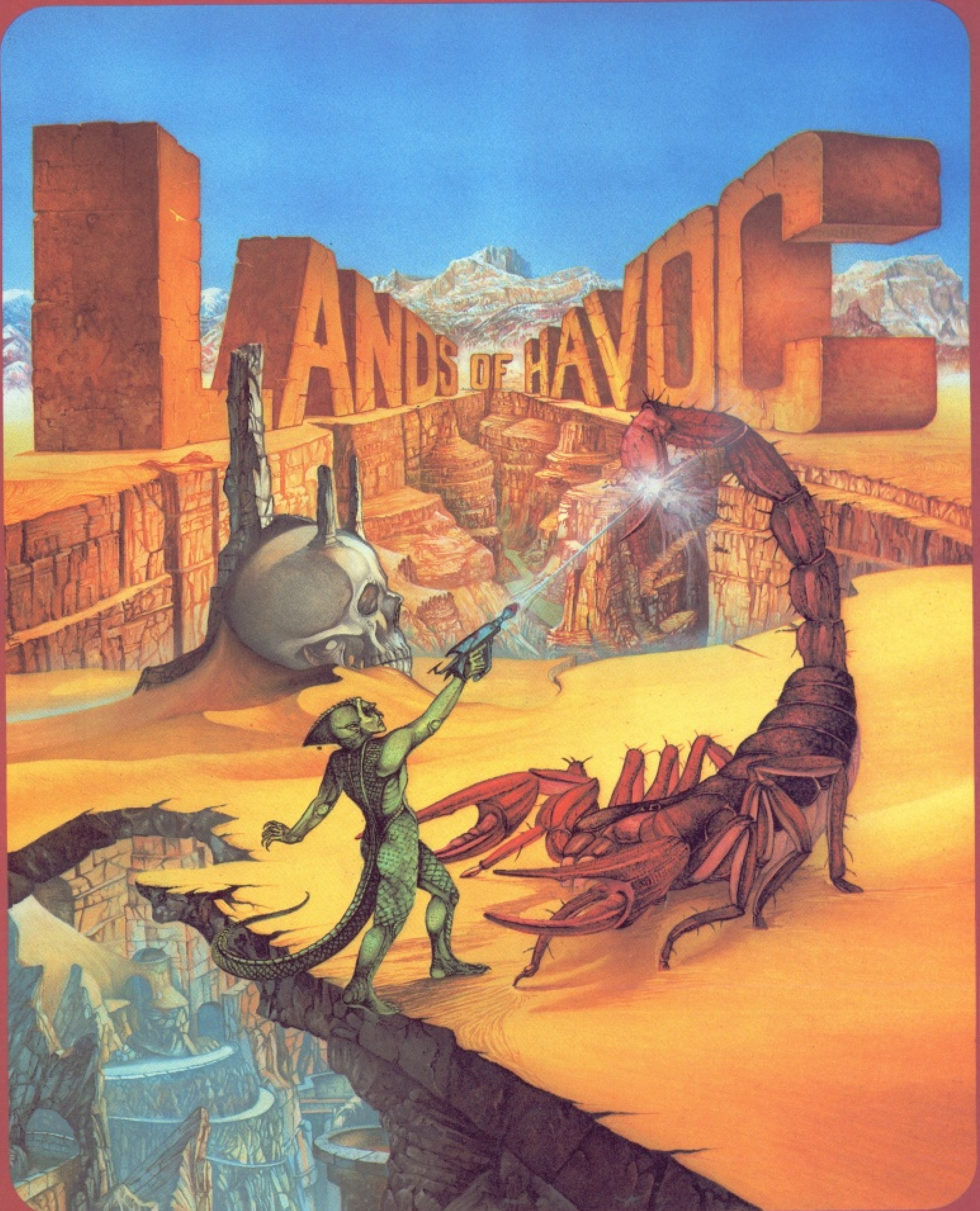
Graphics
Get in the picture with our graphics special

C16
Program the C16 – the first part of a new series

Sports
Be an armchair athlete

BEST SELLER!

COMMODORE 64



MICRODEAL

Our COMMENT

HAVE YOU EVER HAD A HANKERING TO be the computer generation's Leonardo Da Vinci? Have you ever wondered if your Commodore could be the instrument which will lead to the achievement of great heights of art and design? There is a whole world of artistic creation hidden away in your computer and it's just waiting to be let out. Think of all the marvellous programs you could enhance when your artistic talents have been unleashed upon the world.

You may think that this is just a flight of fantasy on our part. Maybe we're hoping that our readers are the best thing since sliced bread (which you are, of course!). However, now's your chance to realise all that potential talent by taking a look at our special graphics features this month.

First on the list is a special review section on graphics software packages. You can get expert opinion on how good each one is and how much use it will be to help you achieve your particular ambitions on the graphics front. It's also packed with lots of really important information like prices and names of manufacturers to make it all easier for you to get hold of. Not to be missed.

Graphics hardware is also dealt with in detail this month. We look at four items of hardware – two lightpens, a touchpad and an electronic mouse (no, that's not something to keep your cat happy on a rainy day!) Even if you don't want to buy any of these particular items then you'll find it interesting to know the facts about them for future reference.

Last, but by no means least, is our graphics program for the C64 which you can type in to get your own personal sketch pad for no extra charge. So if the prices of all these other items have scared you to death then never fear because we're still looking after you and your pockets.



The sporting life

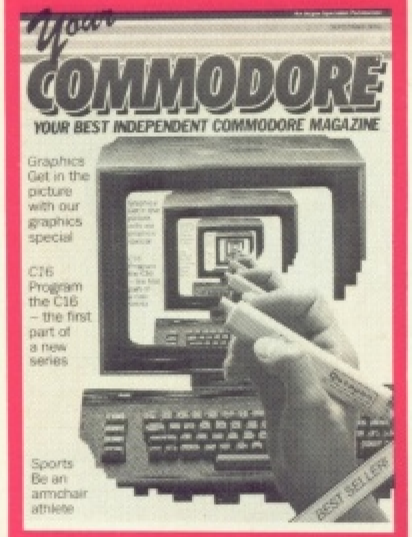
This is also an issue for those lazy armchair sports people who have never managed to get outside and pick up a racket of any description and the only things they ever run for are number 15 buses. We've brought together a collection of sports games currently available and had a really good look at them. There's tennis, snooker, squash, baseball, soccer and fishing so if we haven't catered for your particular taste then it's not for want of trying.

There's now a very wide choice of this type of sports simulation on the market and we've realised that armchair addicts need someone to take the strain out of making a decision, so once again we've rallied round and done what's expected of us. Eric the energetic reviewer was positively whacked by the time he'd been through them all, but we feel that it's done him a lot of good as his hands are now very slim and supple which is more than can be said for the rest of him.

So, just sit down in a quiet corner and have a read of the fruit of his great efforts. There's certainly something to be said for an energetic game of footer in your own home on a drizzly English summer day.

For those who are more interested in the ever popular sport of golf, then there's something for you too. We've managed to put together a competition with a sporting theme and we've got hold of 50 copies of APS's Nick Faldo's Open to give away. There's absolutely no end to our efforts to get you all fit and pander to your whims. So if you don't like baseball and the excess of tennis in the Wimbledon fortnight is still giving you nightmares then turn to our competition and you could find yourself having to choose between a wedge and a driver and wondering what on earth par is anyway!

And that's not all, of course, we've got all our regular features and lots of series to keep you at your keyboard for the whole month till we come at you in October with all your old favourites and some new stuff as well.



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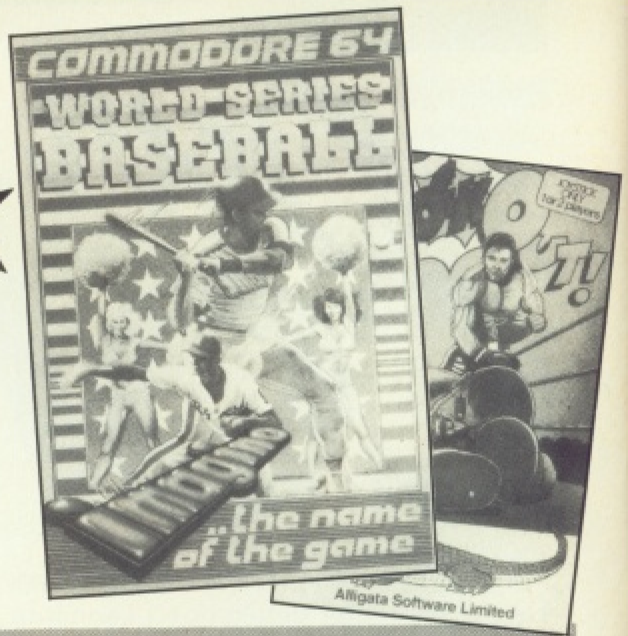
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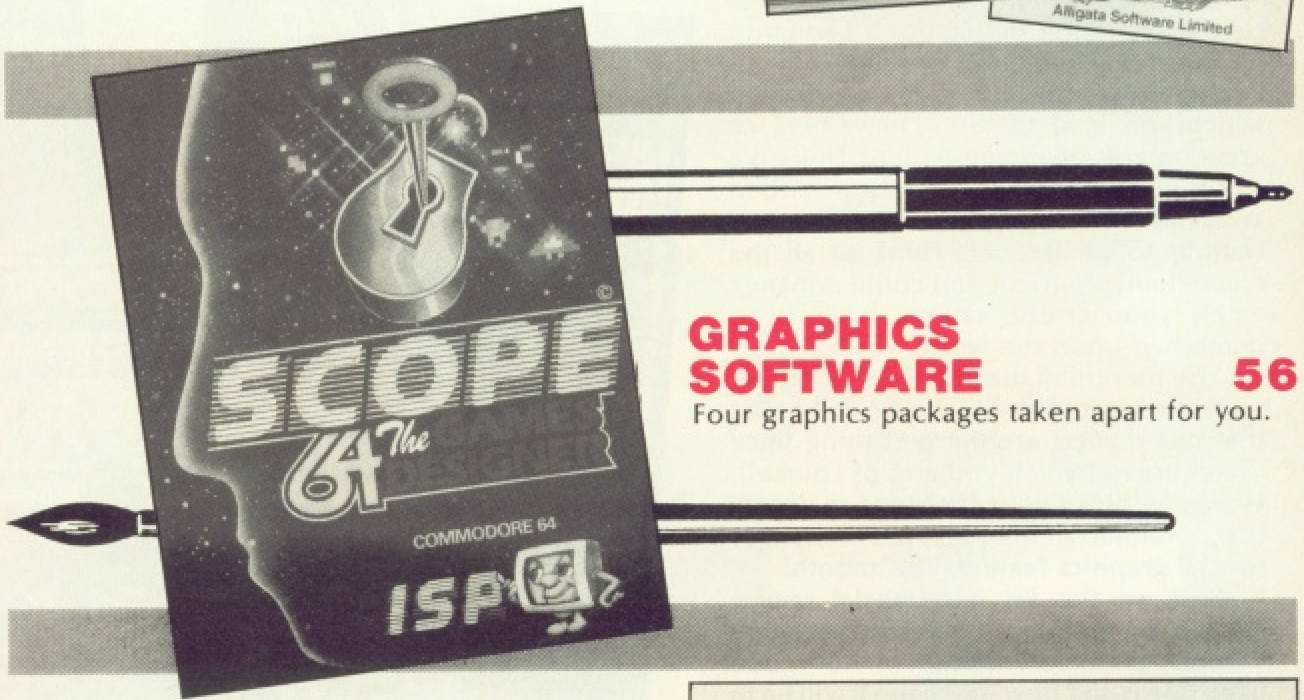
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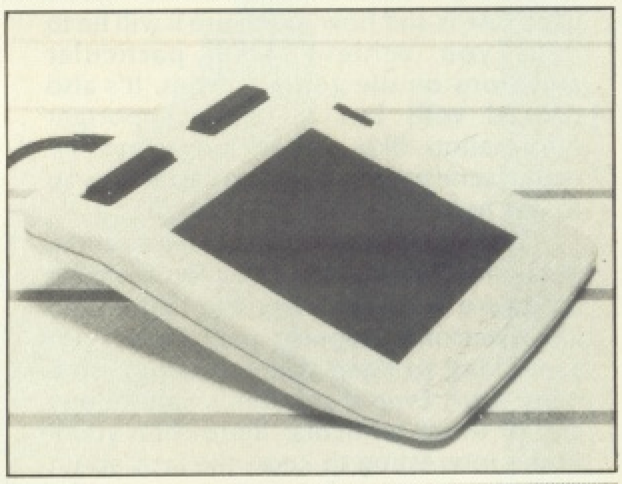
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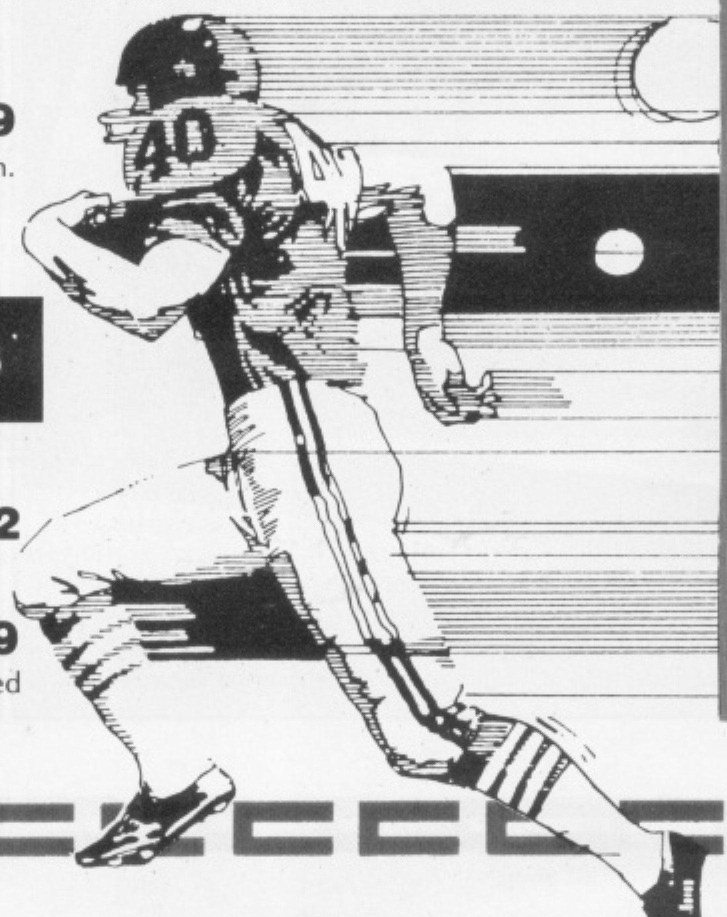
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DATA STATEMENTS

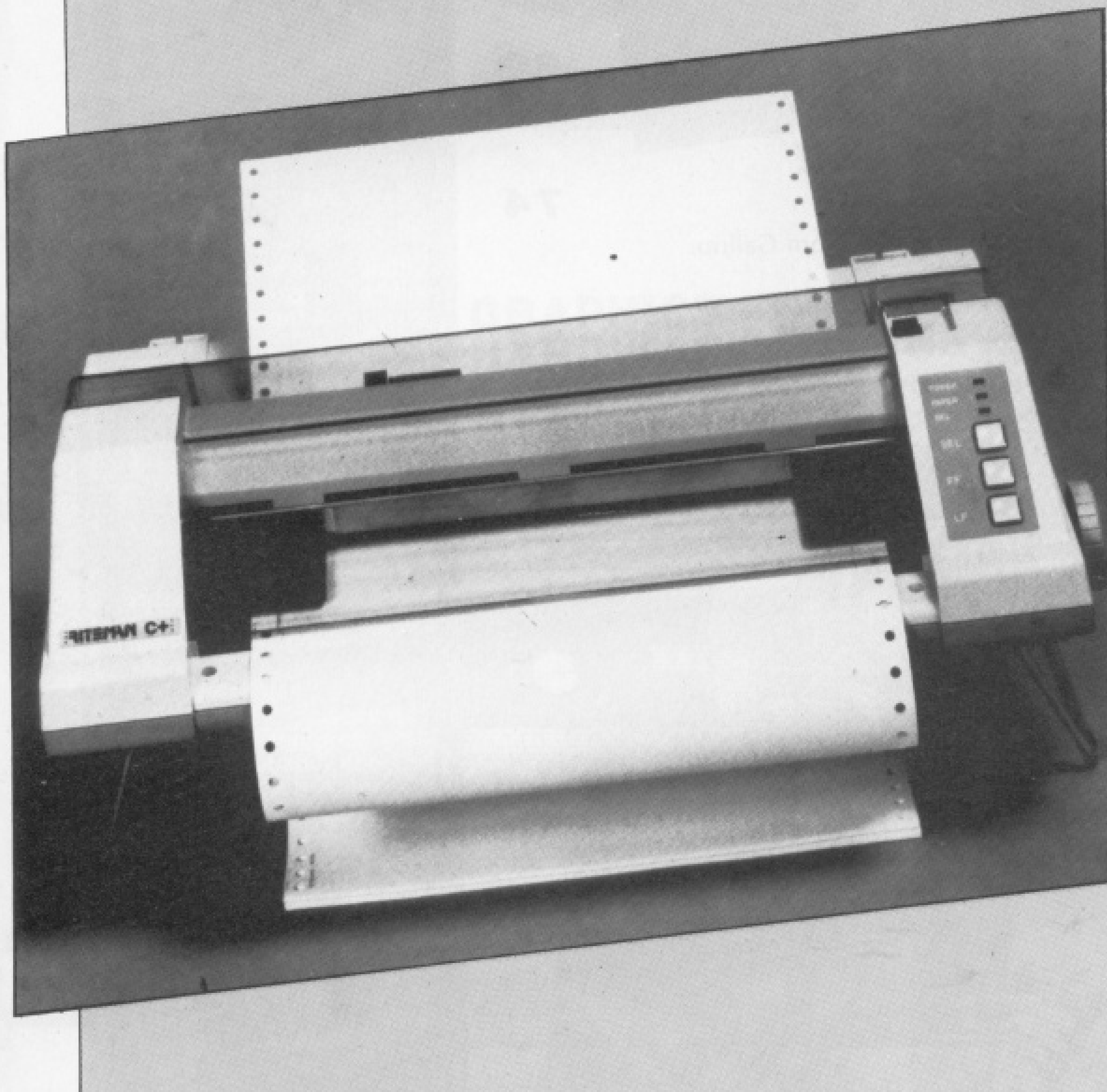
Front Loader

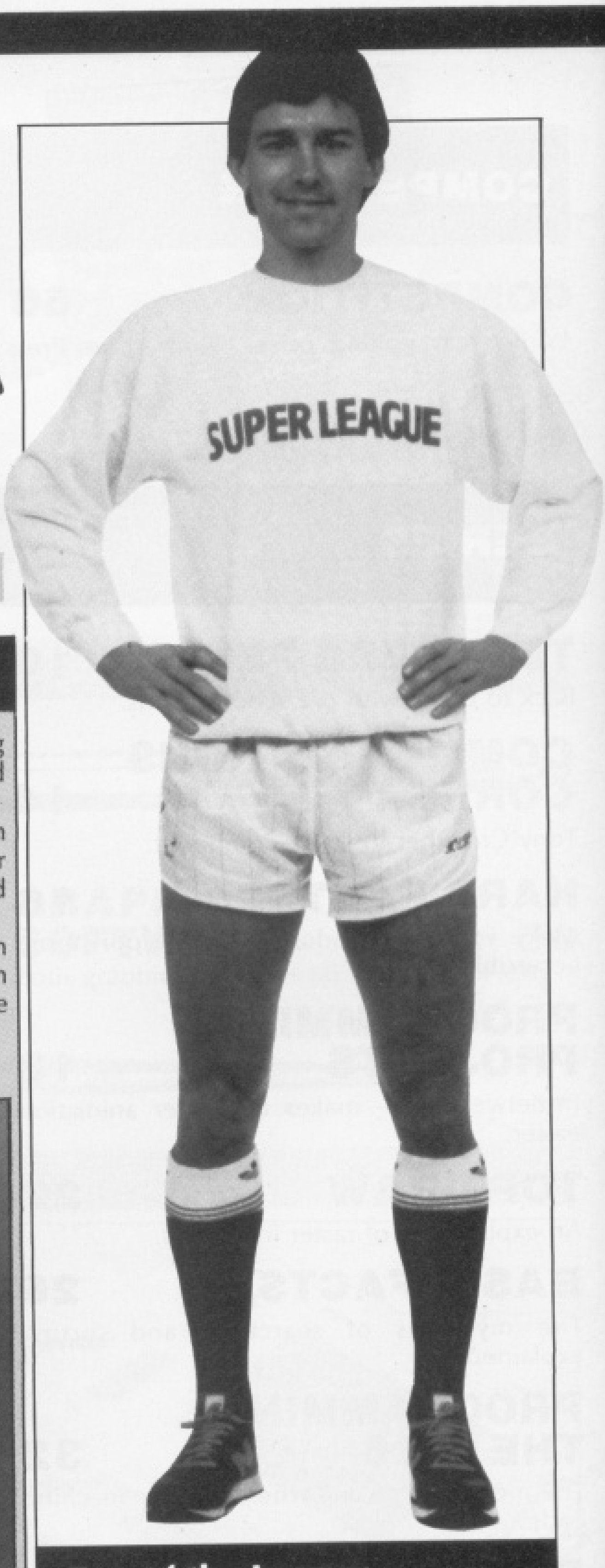
C. ITOH ELECTRONICS LTD HAVE JUST released what they describe as 'a revolutionary front-loading dot-matrix printer, with many unique features'.

The Riteman C+ is aimed specifically at the Commodore market, and is equipped with both CBM 64 and VIC serial interfaces. The front loading design and built in stand mean that paper, leads etc. can be stored directly beneath the printer and save upto 50% desk space. It also offers ten separate print modes, including standard, double-strike, italics and reverse.

The printer accepts paper widths from four to ten inches, and carries four international character sets as standard (USA, UK, French and German).

And, if you want any more information after all that, then contact C. Itoh Electronics, Beacon House, 26 Worple House, London SW19.





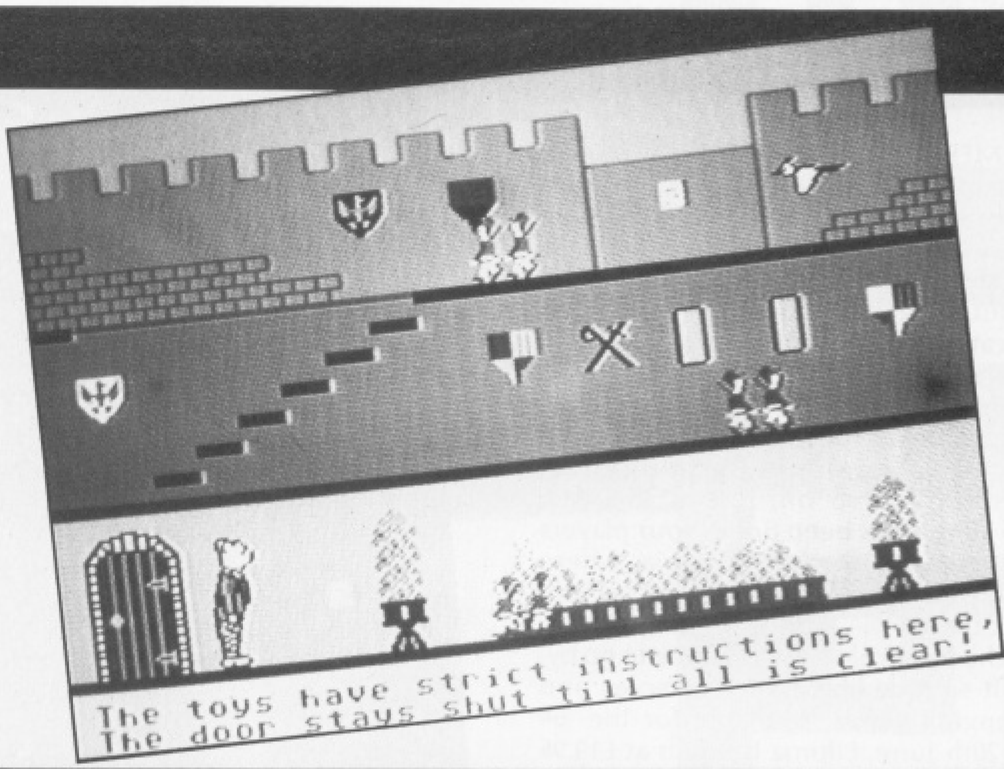
Top of the League

ANOTHER FOOTBALL GAME HAS APpeared, but this one, rather than being an all action arcade game, is actually a computer moderated board game.

'Bryan Robson's Super League' is a game for upto eight players, that puts you in the position of a football club manager. Along with the computer cassette, dice, money, and 'other accessories' are included, and Bryan Robson has apparently said 'This is the best football board game I have played' (though he doesn't say how many of these games he has played).

Priced at £19.95 (!), Super League should be available from branches of W.H. Smith's, for CBM 64, Spectrum and Amstrad from the end of July.

Jolly good fun...



THIS AUTUMN, RUPERT BEAR IS 65 years old, and to join in the celebrations of this great occasion, Argus Press Software plan to release 'Rupert and the Toymaker's Party' on the Quicksilva label, for both 64 and Spectrum.

It seems that old Rupert has been left behind on the way to the party. To get to the party Rupert has to follow a trail of invitations leading through the Toymaker's castle.

With excellent cartoonlike graphics, it's 'challenging, addictive and jolly good fun' (that's what it says on the press release anyway), and will cost £7.95, from;

Argus Press Software, Liberty House, 222 Regent St, London W1.

Performance...

FOR MIDI BUFFS, EMR HAVE JUST RE-leased their Miditrack Performer, which presents a possible alternative to Commodore's own Sound Sampling system. Priced at £45 it should allow you to turn your '64 into quite a sophisticated synthesizer.

For more details, contact EMR at 14, Mount Close, Wickford, Essex.

Computing for all



ARDMORE ADVENTURE, A COMPANY specialising in educational and activity holidays for children, have recently joined forces with Crest Hotels to provide weekend computer courses for both adults and children. The first such course took place quite recently at the Crest Hotel, High Wycombe, with television presenter John Craven present as special guest.

The courses, designed for both adults and children, are aimed at computer users of all levels, and cover topiocs such as programming (beginners and advanced), word processing, information technology and educational software.

The equipment used in these courses is, surprise, surprise, all Commodore. The cost of a weekend course for adults is £85, but other deals are available for parents and children together.

You can contact either Ardmore Adventure (01-439-4461), or Crest Hotels (0295-67733) for further information.

All the way from America

ALL AMERICAN ADVENTURES LTD HAVE just launched 'Exodus-Ultima III' upon the British public. Described as an 'epic fantasy role-playing experience' it certainly sounds like the closest a computer game has yet come to duplicating the game Dungeons and Dragons.

Before starting the game, you must equip a party of four players determining their sex, strength, intelligence, profession and so on, just as in D&D. Once all this has been done, your players then enter the world of Sosaria, where you must track down your enemies and defeat them.

If the press release is anything to go by, then it sounds like a very complex and challenging game. Available for the '64 from 20th June, Ultima II retails at £19.95 (disc), and further details are available from: All American Adventures, Unit 10, Parkway Industrial Centre, Heneage St, Birmingham.



Quickdisc plus

EVESHAM MICRO CENTRE HAVE PRO-duces what sounds like an excellent value cartridge in the Quickdisc+. Designed to speed up the '64's 1541 disc drive, the Quickdisc+ costs only £19.95, much cheaper than many similar cartridges, and offers the following facilities: Fast save and load (4 to 5 times faster than usual), Fast format (10 seconds), Fast file copy and disc format as well as other features.

At £19.95, it sounds like very good value, and further details can be obtained from Evesham Micro Centre, Bridge St, Evesham, Worcester.



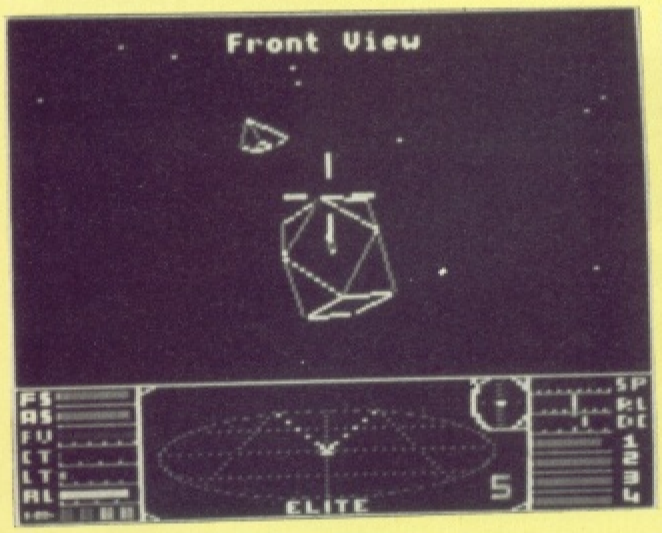
Epyx goes Gold

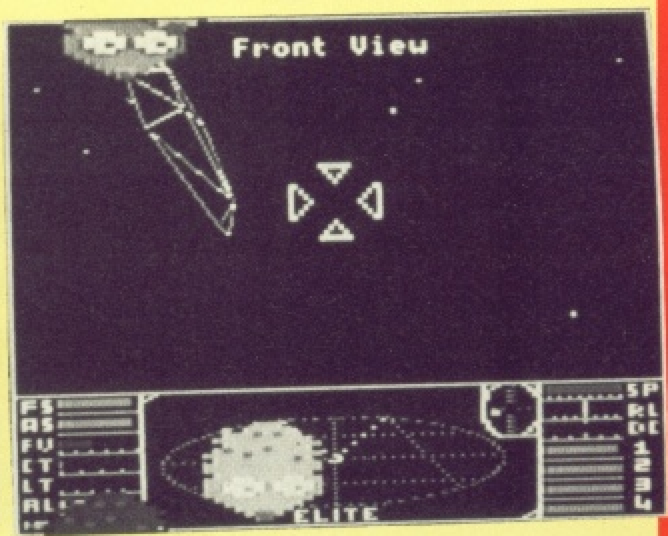
FOLLOWING THE WITHDRAWAL OF CBS from the software scene, Epyx, their software subsidiary, have signed on with U.S. Gold, who will market the Epyx titles under their own label from July of this year.

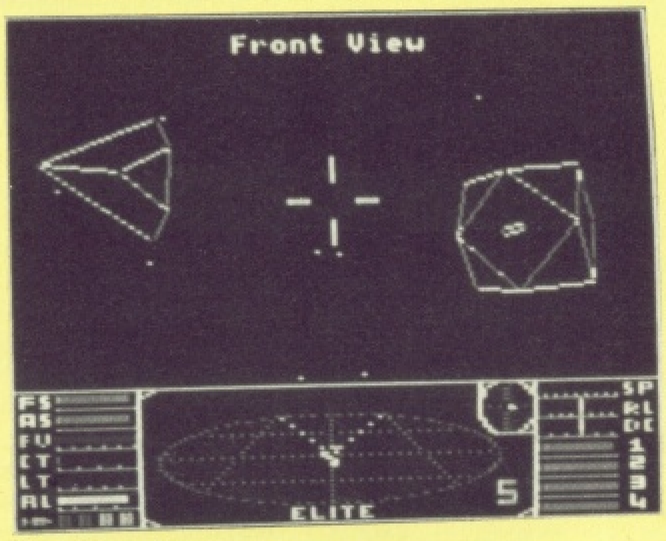
Epyx titles include the past and present bestsellers, Temple of Apshai, and Impossible Mission, and planned releases for the next year include Summer Games II, Winter Games and F.B.I.

The people at U.S. Gold are describing Summer Games II as 'the greatest sports simulation product ever produced'. And Geoff Brown, MD of U.S. Gold, claims 'that the major share of the U.S. market that Epyx currently enjoy will assure an unparalleled success in the U.K.'

E·L·I·T·E







The long awaited Elite at last makes an appearance on the C64

FOR THOSE OF YOU NEW TO COMPUTING (if you've been around awhile, you must have been a hermit not to have heard it), Elite has been the most talked about game since Space Invaders. Now, at last, it is finally outside the domain of the BBC micro owners for whom the game was first written.

Basically, you are meant to be a trader, buying and selling goods to the planets within the galaxy. As you gain credits, it is possible to jump to the other seven galaxies within the Elite universe (though you won't have to worry about this for your first few weeks). Your aim is to gain credits by trading goods and also blasting pirate ships. As you do so, it becomes possible to increase the facilities of your ship. The cost of add-ons varies from 30 credits for a new missile, up to 6000 credits for a military laser. The availability of any given item is dependent on the 'tech level' of the particular planet you are docket at.

One of the first things you notice with the Elite packaging is the high quality maintained throughout. This isn't your average game with the instructions printed on the sleeve of the cassette case. This box contains plenty to keep you amused for hours, and that's before you even load the game. Before you read the instruction manual (called the 'space traders flight training manual') I recommend that you read 'The dark wheel' a mini (48 pages) novel by Robert Holdstock which is also included in the pack. It's quite good and should get you in the right frame of mind for the game.

The training manual, like the rest of the pack is a high quality document and is even longer than the mini novel at 64 pages. There are very few actual instructions in the manual. It deals more with the many aspects of being a space trader. There are eight chapters covering navigation and flying, interplanetary travel, combat, intergalactic trading, a political profile of the universe, and a guide to the other types of ship you may encounter on your travels. Screen and keyboard shots are used throughout to aid clarity. Other items of documentation include, a mini ship identification poster, a quick guide to the keys that control your ship (53 keys are used in all in 6 different modes), and the last thing to come out of the box before the cassette is a cardboard keyboard overlay showing some of the more important commands.

If you have the cassette version of the game, it takes quite a while to load, but don't fear, it's well worth waiting for. The screen display is split into two sections, the main view outside the cockpit (either right, left, front or back, whichever is selected). The other section of the screen shows the internal cockpit indicators. There are twelve of these in all, the largest being a 30 short range scanner. Also on view; front and aft shield strength, cabin and laser temperature, altitude, number of missiles remaining, compass, speed indicator, roll and climb status, and the amount of energy remaining in the four energy banks.

All transactions take place in the spinning space stations above the planets. It is here you start and this is the only place where you can save the game. For those of you who have never seen the game on the BBC, I am not going to give any hints as to how you can amass lots of credits quickly. Needless to say, it is important to gain confidence of flying and combat, as this is the way to achieve Elite status. There are many small things along the way that will help towards your goal, some that simply prevent you being destroyed. Keep your eyes peeled on to the various magazines, and I'm sure that you'll pick up all sorts of bits and pieces.

From the brief description of the game that I've given here, you will realise that there is a high degree of complexity involved. Don't let this put you off, if you miss out on Elite, you miss out on one of the best computer games ever written.

Teacher's Pet

Margaret Webb goes back to school and takes a look at Pre-school maths.

IN THE LIGHT OF THE RECENT REPORT from Her Majesty's Inspectors on the ability or otherwise of our children to tackle mathematics competently it is worth looking at the range of material available for the Commodore 64.

It has been suggested that more use should be made of calculators in the classroom. This is all very well as long as the user has the basic ability to understand the numbers being used and be able to spot any errors made. This all leads back to early learning and a good grounding in basic number skills. With good foundations in the concepts involved more advanced skills should slip easily into place.

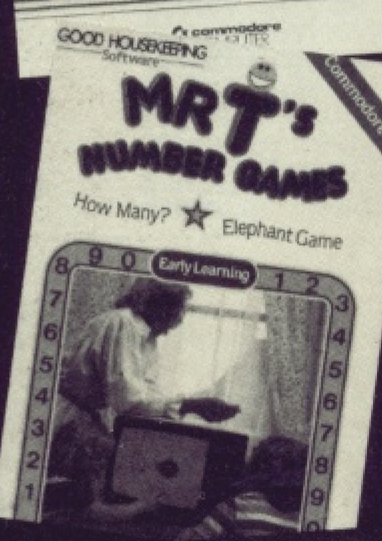
There are computer programs to cover all levels of mathematical skills from pre-school through to 'O' level revision and even a package aimed at the adult market dealing with mathematics in a business context. However, just because there are plenty of programs it does not mean that they are all good. As with the material available for the teaching of reading great care must be taken before purchasing a program and all considerations, as to what is to be taught, examined.

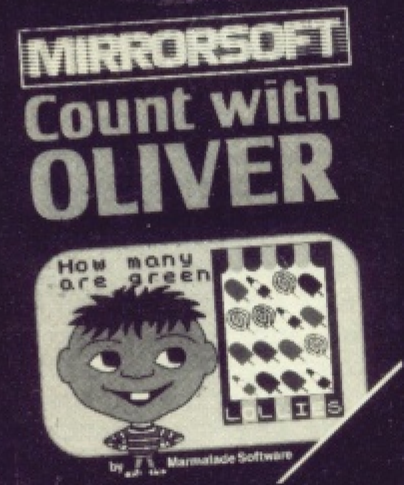
As with the teaching of reading even the youngest child can be caught using the computer as a medium. One of the first skills to be learnt is the relationship between a number of objects and the numeric figure. There are several games on the market dealing with this. Commodore market an A.S.K. package called 'Let's Count'. This is a two cassette box containing four games. The first game Treasure Island has the child matching equal quantities of shield on pirate ships to treasure chests on islands. The second game moves on to matching objects in a space station to numbers. Space Hopper deals with the difficult concept of more, less or the same by asking the child to decide whether there are more red packages or brown before they are loaded onto the space ship. The final game in the package gives the child practise in getting the numbers in their right order; a correct answer gains a reward in the shape of Mr Muscles ringing bells.

Each of the games is well thought out, has beautiful graphics and effective use of sound.

Mirrorsoft have a package with similar aims to Let's Count. 'Count with Oliver' is a double sided cassette. On one side Oliver, a delightful cartoon character, learns how to count in a toyshop. He also teaches the user the figure that fits the number. On the reverse Oliver learns simple addition and subtraction in a sweetshop. This consists of Oliver buying sweets, adding more and then eating — subtracting — some.







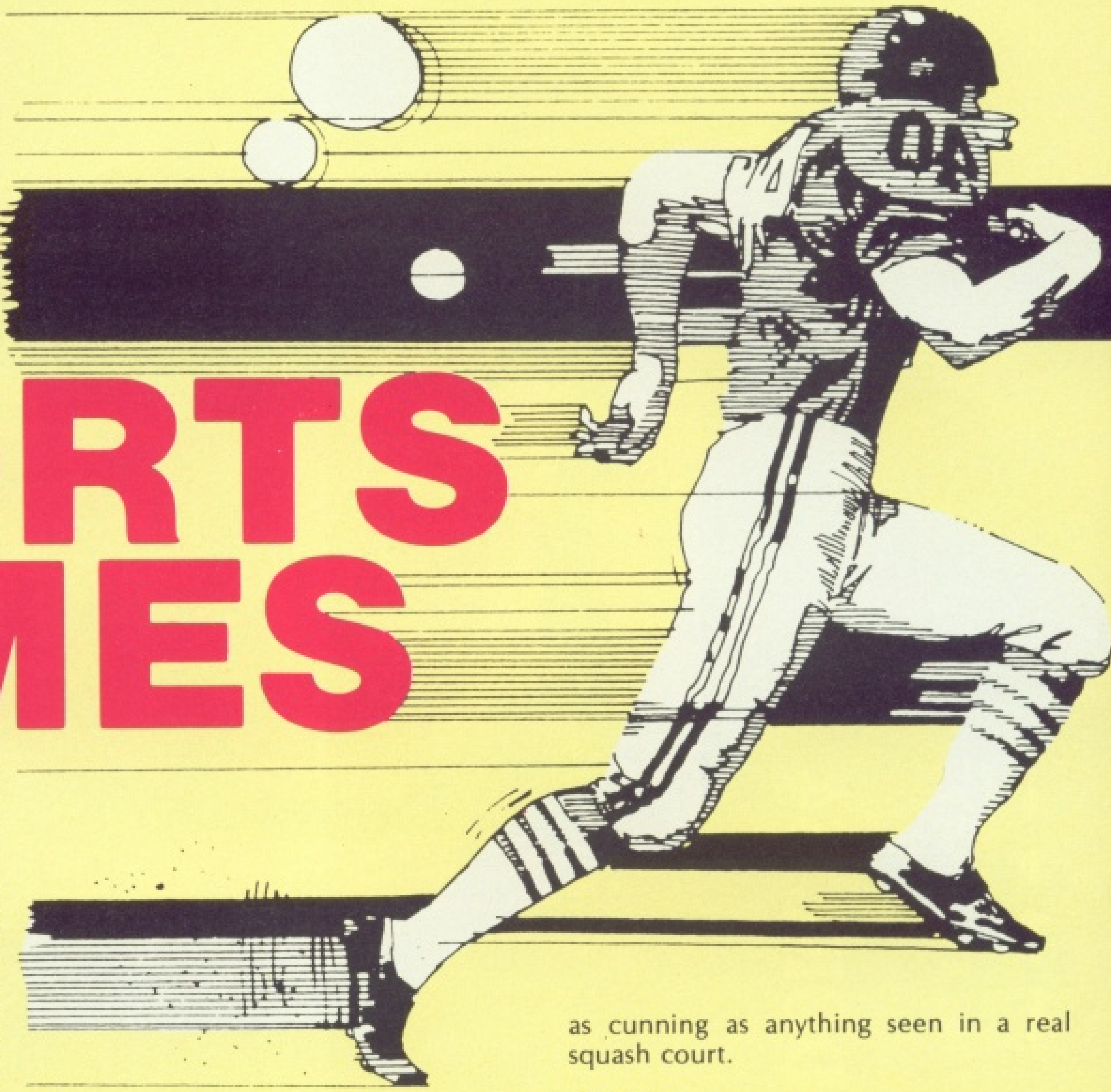
One of the best early learning programs I have seen recently is marketed by Fisher Price, a firm with a good name in the toy world. Their 'Up and Add' Em' is a cartridge based program which aims to teach number, figure relationships and simple addition. It does this using bunnies, ducks and penguins floating on strings of balloons to create a rainbow. This program is so appealing and easy to use that my four year old sits and plays by himself — he is learning too.

Further programs dealing with this part of learning numbers are Mr T's Number Games in which the child counts spots as they jump on and off a ladybird and Toddler Tutor — Channel 8 software — which has a section on counting toys.

Of course, as with reading, all the concepts and skills learnt with the programs discussed are the sort of thing that most others automatically teach their children in the course of a normal day. We count eyes, shoes, milk bottles on the draining board, in fact anything that comes to hand. We teach through hands on experience so why bother using the computer? Well, as every mother knows, there is more to a day's housework than counting biscuits and it is handy to be able to sit a four year old down for a little time with a game which has been developed by a team of educationalists and computer experts. I am not advocating leaving your child with the computer for hours on end - you must take an active role in his education - but the Commodore 64 has the power in its graphics and sound capabilities to captivate him and hopefully he will get that basic foundation from which he will be able to build real understanding of mathematics.

Let's Count — A.S.K. — Commodore, 1 Hunters Rd., Corby, Northants NN17 1QX
Count with Oliver — Mirrorsoft — Holborn Circus, London EC1P 1DQ
Up and Add'Em — Fisher Price — W.H.S. Leicester
Toddler Tutor — Channel 8 Software — 51 Fishergate, Preston, Lance.
Mr T's Number Games — Ebury Software — 72 Broadwick St., London W1V 2BP

Eric Doyle has worn himself out looking over some of the sports simulations that are available for the Commdore 64.



SPORTS GAMES

LAST SATURDAY I PLAYED A FEW frames of snooker followed by three tennis matches, a game of squash, two games of baseball, a game of soccer and then went fishing and after lunch... OK, I'm not Superman but with such a range of computer sport simulations available I can dream, can't I?

The range of sports programs is daunting and the recent growth in this area of computer games has many puzzling aspects. For example, baseball had never proved popular in this country until the release of Imagine's World Series Baseball game which shot to Number 2 in the Charts.

As athlete's foot gives way to joystick finger the time is right for a sporting guide to the 64.

Tennis

Tennis was probably the first sport to be simulated as a computer game some fifteen to twenty years ago. By modern standards these arcade machines were crude bat and ball games which would probably be turned down as a reader's contribution to our listings pages. It's amazing how standards change.

Match Point by Psion was an excellent game on the Spectrum but the conversion for the 64 failed to impress.

The problem with the game is one which is common with many 3D simulations and stems from the difficulty of estimating the ball's position in space. With Match Point such spacial awareness was essential because the stroke played depended upon the direction of the player's movement and where the ball made contact with the racquet in its arc of swing.

Such precision proved frustratingly impossible and for a long time I blamed the programmer, then along came Activision's On Court Tennis. Like most of Activisions sport games the options are mind boggling. Not only can you decide which shot to play by careful joystick selection, but you can also opt for a style of play by selecting from four 'personalities' based around current tennis champions.

Despite this flexibility and control I still found positioning my player for return shots to be difficult. It was only when I tried Commodore's own International Tennis that I realised why. It all hinges on viewpoint. Both Match Point and On Court take the standard TV viewpoint from the baseline, parallel to the net. This has a double disadvantage. The arc and speed of the ball can only be judged by the relative positions of the ball and its shadow but its angle across the court can be easily seen.

International Tennis uses a viewpoint which is at right angles to the net. In this case the speed and arc of the ball can be seen but the cross-court angle can deceive. Despite this last point I found this version to be the most satisfying version.

In this section I shall also include Jonah Barrington's Squash (New Generation Software). This is one of my personal favourites despite the fact that the voice synthesis of Jonah calling out the score gets on my nerves. The court is viewed from behind the players and the game is as cunning as anything seen in a real squash court.

Athletics

This is the most competitive area in terms of the number of games available. Activision are there with Decathlon, Ocean have Daley Thompson's Decathlon (with the promise of more when their conversions of Konami's arcade games become available), Martech's Superstar Challenge and Quicksilva's Summer games.

The unique factor with these games is that you must actually expend energy to achieve success, just as in the real track and field events. Each program is in fact a compendium of games but the principle in most cases in the same. Waggling the joystick from side to side causes the athlete to exert himself according to the rate of waggle; the faster you go, the faster he goes!

Having watched a room of summer camp kids trying to outdo one another with the Activision game, I think I know what Ken Russell's film of Doomsday at the Wailing Wall would look like. A deeply Freudian scenario, indeed.

The real exception to this rule is Superstar Challenge which requires a slightly different approach because it includes a system called powersync. This means that the speed must be built up slowly, desperate waggling has very little effect. In addition to this the squat thrust

section requires rapid, co-ordinated joystick movements to score points. The range of games is also much wider than with the other packages, encompassing cycling, swimming (also featured in Summer Games), ball control, canoeing amongst others including the dreaded arm dips.







Basketball and Soccer

Until the release of Commodore's International Basketball, the only version of this sport for the 64 was One-in-One from Ariolasoft. This is an implementation of what was a training exercise with only two players alternately attacking or defending a single basket one from the other. Despite the fact that it was endorsed by two of America's basketball greats it never really got through to me.

International Basketball is a different proposition and its only drawback is the way it reminds me of the much earlier International Soccer. In both games you control the player who is either nearest to or in possession of the ball. The choice is then yours as to whether you should pass, dribble or shoot.

Both firm favourites of mine, it looks as if Basketball is going to emulate soccer in a period of chart domination (and quite right too).

American imports

America's National Sports, baseball and football, are available under the Activision name which isn't surprising since the firm is based in the US. Unfortunately it is this ethnic origination which will probably hold up the games' progress in the British software stakes.

As usual, Activision have gone for complexity of game options at the expense of graphic display. This makes the instructions difficult for us Limey's to grasp and sends someone like me reeling towards Imagine's much more comprehensible World Series Baseball with its stunning graphic display and well thought out viewpoint. The game has not got the versatility of Activision's program but its position in the software charts in recent months speaks volumes.

Unfortunately, the only version of American Football to come from across the sea is the Activision one with its enormous spreadsheet of instructions which I'm still trying to fathom out properly (wish I'd watched the series on Channel 4). I only hope that someone feels inspired enough to devise a computer rugby game.

Motor racing

Principal contenders in this group are Pole Position (US Gold) and Pitstop II (CBS-Epyx). For once I have no real preference since these are two totally different approaches to the same problem.

Pole Position is the older of the two games in the sense that it has long been a favourite with Atari owners. I believe it was also the inspiration for Bubble Bus' Aqua Racer which is a wet version of Pole Position in most senses of the word. The art of the game is to stay on the track and overtake the other cars to reach or maintain first place. To summarise the aims they are: steering, speed and position.

Pitstop II on the other hand will not allow the car to leave the track but tyre wear results from rubbing along the edge of the track. Petrol can also run short so pitstops are essential, hence the name.

The screen is split horizontally to show your car in one window and your opponents car in the other. The nice point about this is that you can watch your car streak away in your opponent's window, or vice versa. Your aim in this game revolves around strategy, can you afford to make a pitstop or will your petrol and tyres hold out?

And the rest

When I think of all the sports I've missed it makes me realise why I called this a daunting task earlier. For example there's Karate in the form of The Way of the Exploding Fist (Melbourne House), Graham Gooch's Test Cricket (Audiogenic), pool and billiards from Bubble Bus (Hustler) and Visions, the excellent ice-hockey simulation called Slapshot (Anirog), the not so good Motocross (System 3) and BMX Stunts (Jetsoft), the punch-drunk Knockout and esoteric Match Fishing (both Alligata).

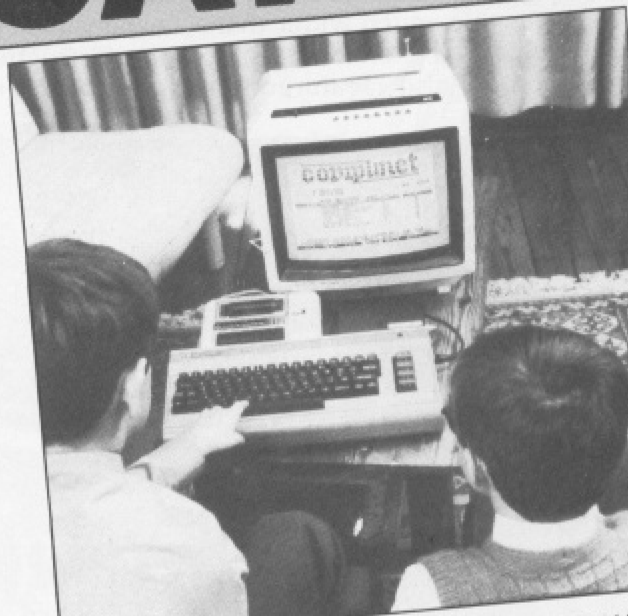
I'd especially like to mention Nick Faldo's Open from Argus Press Software which sets a new level for golf simulations.

Perhaps one day a new sport will be invented by a computer programmer in the way that Rollerball was invented by a film crew. Which reminds me there's also a computer version of that, Rocketball (IJK).

Finally a word of advice. Most sports games have two player options, use them, it's much more fun than playing an intransigent heap of plastic.

COMMUNICATION CORNER





Your Commodore takes a regular look at communications and this month Tony Crowther examines Compunet.

OVER THE NEXT FEW MONTHS YOUR Commodore will be taking a regular look at the world of communications. Since most purchasers of modems for the Commodore machines will buy the one that is manufactured by Commodore, and the modem comes with a free year's subscription to Compunet most of the articles will be based around this system. If you haven't got a Commodore Modem then don't worry, other systems will be covered.

So, if you have any questions about Commodore communications then why not drop us a line, or even better if you have a Commodore modem then why not send a letter to the magazine by using the MAIL facility, our ID is YOUR CBM.

One of the most common questions that we are asked about Compunet is, 'What is Compunet?'

Well, basically Compunet is an information storage system which you can get access to from your own home by using a Commodore modem. Any information on the system is stored in pages. It is possible to read the information on any page simply by moving to it, just like a paper back book. The pages are further divided into what could be called chapters. Each chapter will cover a particular subject. For example page 600 is the start of an area called the JUNGLE.

Some of the pages on the system hold computer software. Many of these pages have a charge for looking at them, though once you have paid for the pages you can save them onto tape or disc so that you can run the program any time you want. Quite a number of different programs are available on Compunet, in fact many of the well known software houses put their programs on the system. Sometimes software is also cheaper than it is in the shops. Some of the companies that sell software through Compunet are: Thorn EMI, Llamasoft, Aligata, and of course Commodore.

The JUNGLE is probably the most popular area on the system. This is an area (at page 600) where users of the system can store their own information. One of the most Common uses for this area is the uploading of users' own software so that other users can have a look at your latest masterpiece. You can even charge people who want to buy your programs. Some programs are free but most do have a small charge, especially when you realise that you are charged 1p per page per day for anything that you have on the system, an average program will probably cost around 20p per day at this rate. Be warned though, it is possible for people to vote for your programs so don't put any rubbish up or people will start to think that your programs are no good.

Many of the well known faces can be found in the JUNGLE, Virgin have an area called 'Gang of five' and Jeff Minter has a section called 'Yak the hairy'. At the moment Jeff is offering two free games in this section. One is called SYNCROW the other is a demo of Psychedelia.

Hard-working modems

Another fairly common question about the Commodore modem is if it will work with other systems. The simple answer to this is yes, but you will have to buy some software to do it. Don't worry though, most of it is available on Compunet and much of it is free.

If you wish to access PRESTEL or any other Viewdata type system then you will need the Viewdata software. This is well worth having as many bulletin boards are starting to use this form of information storage. A subscription to Micronet is a must, don't forget your Compunet subscription is free for the first year so you will only have to pay for Micronet. Micronet has many other machines on the system and is a lot more general in its coverage. You can even get a weather report on Prestel which comes free with Micronet. Next time you go into a travel agents take a look at the booking system they use, in many cases they will be using Prestel to check on the availability of holidays.

Talking terminals

Another program on Compunet called terminal will allow you to talk to any other computer, the only rule being that the computer that you are talking to must be able to work at 75/12000 baud. So if you want to talk to your friend and he owns a BBC then it is now possible.

Don't forget, if you have any questions then drop us a line.

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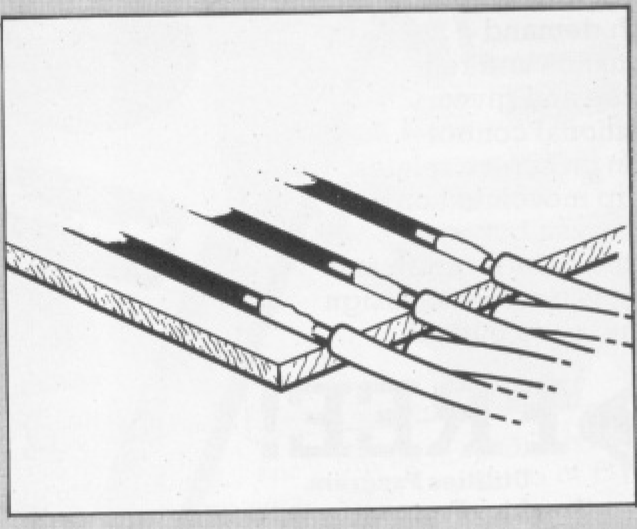
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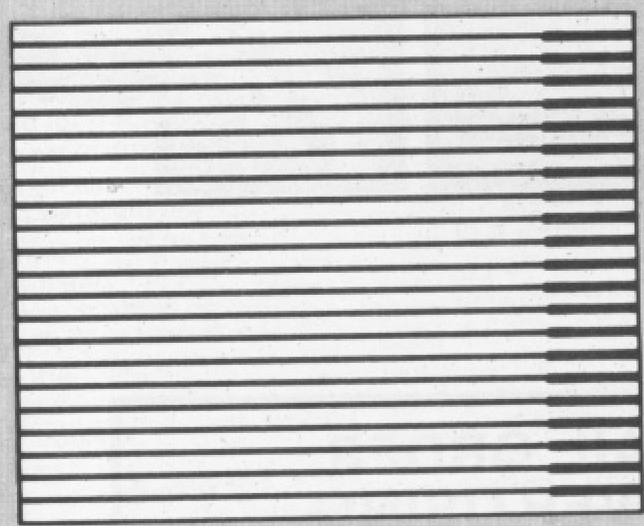
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HARD FACTS

The man with the soldering iron, Mike Roberts', builds a device to make the Commodore cartridge port more accessible.





THE PROJECT THIS MONTH REQUIRES – horror of horrors – the construction of a PCB, or Printed Circuit Board. Actually for our purposes the meaning of 'printed' is different from the usual ink on paper method.

A PCB is a sheet of fibreglass (or possibly other media) that has on one or more sides a network of copper strips. Components are attached to the strips and thus make a circuit. The PCB is made by getting your bare board, which starts off with copper all over it. Printing your design on the side or sides as necessary, and then removing all the excess copper.

The design is printed on the board in resistant strips or in etch resistant ink. You then place the board in a mild acid. The acid disolves away all the bits you don't want and hey presto! the first stage is finished. Next you take a drill and drill any holes needed for components and solder them in. Then you're finished.

As usual all the equipment is available from Tandys. I have been critisized recently by naming Tandys as a source of all components. This is because they are expensive. True they are a bit pricier, but they are local and have everything you want. Other sources tend to be mail order only, and you have to know what you are doing to order the bits. However other suppliers that I can recommend are Maplin, Radio Spares (RS), and Watford Electronics – see adverts in electronic magazines for details and addresses.

Tandy have a PCB etching kit at about £14, however they also sell the component parts of this separately and at a cheaper price, so it may well be worth asking the assistant for help in getting exactly what you need. If you do just get the kit you will also need a saw to cut the board, and a double sided PCB board, instead of the single sided one in the kit. Other items are useful such as files, knives, and wire cutters. Otherwise you will only need the equipment listed in earlier articles.

Now you've got all the gear you will want to know what you are building. Well, it is a bus extension device that connects cartridges and add ons to the C64 via a cable. This means that you can attach switches and LEDs to the bus without disturbing the cartridge port. Next month I will be dealing with the various things that you can attach.

Also as everything attaches onto a cable it gives you more room to play with at the rear of the machine for the longer peripherals that can be attached.

To do this you will need in addition to that which has been mentioned a length of ribbon cable (44 lines, though you can use strips of less such as two strips of 25 way cable as it's cheaper), and a 22 way double sided 0.1 inch edge connector, Tandy do not sell these but they are available from most of the sources listed above.

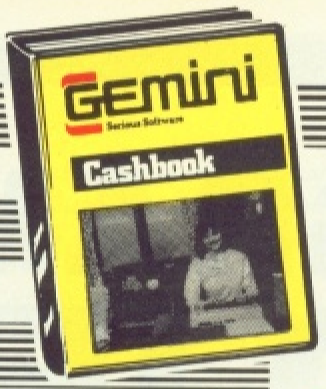
Now you must cut the board to the same size as indicated in the diagram, check that it fits by shoving it into the cartridge slot at the back of the C64 (with the power turned off of course!). Next you must lay out both sides of the board in the same way as is in the diagram, with the etch resist pen. The same pattern must go on both sides of the board and must be of exactly the same dimensions as the diagram end of the board.

When you have etched your PCB you can strip the wires at both ends of the ribbon cable and separate the wires from each other for about three quarters of an inch down the insulation. Now bend alternate wires up and down so that odd numbered wires go on top of the board and even numbered wires go down to the bottom. Tin the wires and the edge of the board with the thin lines and solder the wires to the thin lines. Do the same with the edge connector at the other end. You will now have your completed board. Before plugging it in make sure that you have checked that there are no shorts between the lines as solder can fly, and the connections are very close together.

Important Safety Note

The acid used to remove the copper on the board is Frerric Chloride and is extremely dangerous. It should not be used by persons under 14 at all and only by people under 16 with supervision. Also read the diposal instructions carefully – you wouldn't believe what it does to copper piping!

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Garry Marshall takes a look at in-betweening. A method that will make computer animation easier.

PROGRAMMING PROJECTS

THE OBJECT OF THIS month's project is to develop a program that, when given the first and last pictures of a sequence, can then draw all the pictures in between them on the high-resolution graphics screen.

The technique that produces all the pictures between the first and the last, and in the correct order, is known as "in-betweening". It is used in the production of sequences for cartoon films, where computers have taken much or the drudgery out the jobs of animation artists.

As this suggests, a successful program for generating picture sequences can be used to create animated effects, mobile graphics, or even just a developing sequence of still pictures for use at different stages in an adventure game.

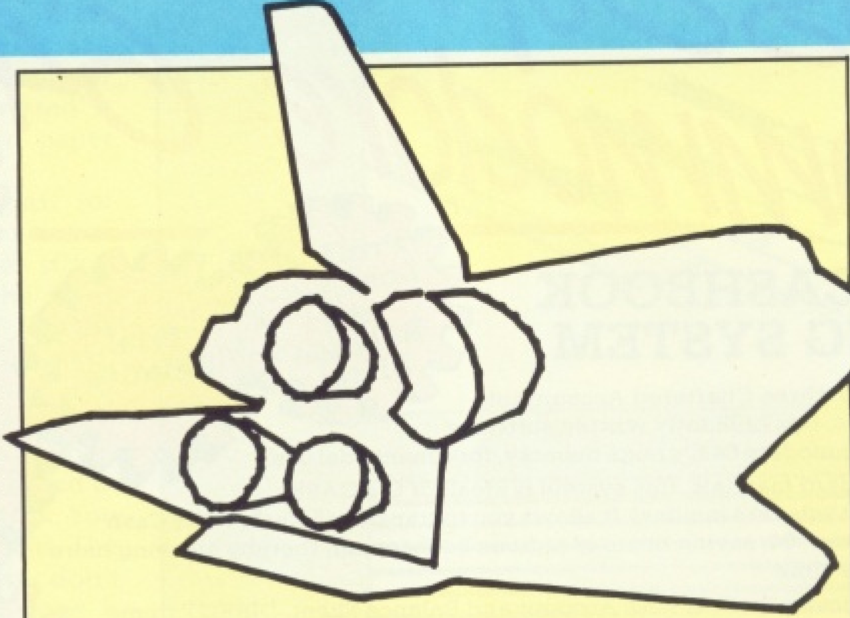


Figure 1

The Solution

We can begin from the idea that a picture can be drawn by joining up a number of points with straight lines. Even an image as complex as that in Figure 1 can be seen, on close inspection, to consist of nothing but straight lines. To draw on the high resolution screen, then, we can record the positions of the points that must be joined by storing the number of the column and row of each of the points in the corresponding elements of a pair of arrays. If the arrays are named X and Y, the column number of the first point will be stored in X(1) and its row number in Y(1), and so on for the other points. Using N to hold the number of points that make up the picture, it can now be drawn, with the aid of a subroutine starting at line 2000 that draws a line from the point in column X1 and row Y1 to that in column X2 and row Y2, by:

```
50 FOR K=2 TO N
60 X1=X(K-1): Y1=Y(K-1)
70 X2=X(K): Y2=Y(K)
80 GOSUB 2000
90 NEXT K
```

If we want to join the last point to the first one, making a closed shape, then we must not forget to add:

```
100 X1=X(N): Y1=Y(N)
110 X2=X(1): Y2=Y(1)
120 GOSUB 2000
```

The subroutine for drawing the straight line is one that we have used before in more than one project, and we will not dwell on it further (While on this topic, we shall also make use of a previously-used subroutine to prepare the high-resolution graphics screen. This one starts at line 500).

In our program, we shall store the column and row positions of the points in the first shape in the sequence in arrays called, respectively, XF and YF. In the same spirit, the positions of the points of the last picture in the sequence will be stored in the arrays XL and YL. The program will create its shapes by joining only four points. This is quite enough to show the idea, but nothing like enough to produce a convincing picture of some real object. The trouble with producing realistic pictures such as Figure 1 is that a very large number of points must be joined. To make this possible without spending days working out the positions of the points and typing the resulting DATA statements, it is usual to enter the points using a digitiser or graphics tablet.

Knowing the first and last pictures of the sequence, the picture that is half-way between them can be found in the way illustrated in Figure 2. A scheme for drawing it, based on this, is:

```
50 FOR K=2 TO N
60  X1=(XF(K-1)+XL(K-1))/2:
Y1=(YF(K-1)+YL(K-1))/2
70  X2=(XF(K)+XL(K))/2:
Y2=(YF(K)+YL(K))/2
80 GOSUB 2000
90 NEXT K
100  X1=(XF(N)+XL(N))/2:
Y1=(YF(N)+YL(N))/2
110  X2=(XF(1)+XL(1))/2:
Y2=(YF(1)+YL(1))/2
120 GOSUB 2000
```

This code can be generalised to give F equally spaced in-between pictures, rather than one, just as Figure 2 can be generalised to show a sequence of in-between pictures as illustrated in Figure 3. The corresponding BASIC instructions appear in lines 140 to 180 and 200 to 240 of the completed program, which is listed as Figure 4. It should be

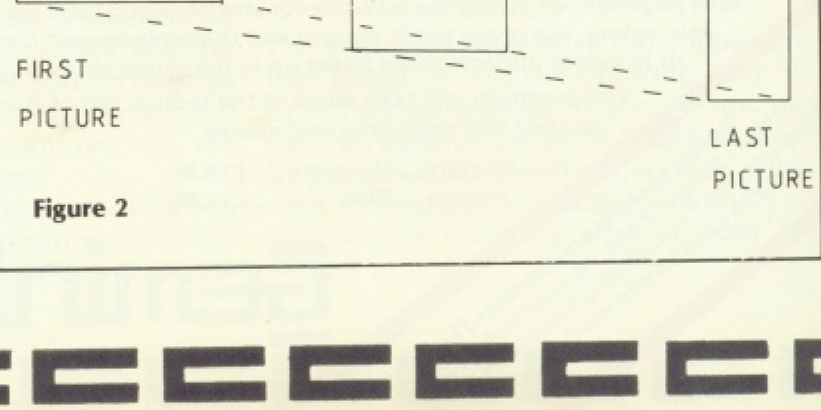


Figure 2

noted that these lines are inside a FOR - NEXT loop controlled by the loop variable I, which takes values from 0 to F+1. If it only went from 1 to F, then only the F in-between frames would be drawn. When I is zero, the loop causes the first picture to be drawn... Setting 1 equal to zero in line 160, for example, reduces it to X2=XF(J). Similarly, when I is set to the value of F+1, the last picture is drawn, as a test corresponding to the one just described will show.

The complete program listing in Figure 4 begins by giving values to N for the number of points to be joined up and to F for the number of in-between frames. It then dimensions arrays to hold the positions of the points of the first and last pictures, before reading them into the arrays from DATA statements. The high-resolution graphics screen is then prepared before the loop that plots the first picture, the F in-between pictures and the last picture is reached, so that the program can draw all the pictures.

Further Developments

The program can be amended to produce animated sequences, rather than drawing all the frames and leaving them all on the screen as this program does. To do this it needs to be modified to erase the current picture just before it draws the next one in the sequence. The trouble is that the production of the graphics is so slow that there is no chance of creating anything like convincing movement. It just won't be fast enough to look like a movie. Even if it were fast enough, there would be a problem in controlling the movement, because the computation required for some of the frames takes longer than for others. This means that the frames will not appear at regular time intervals. To overcome this, the start of each frame could be triggered at equal time intervals from the computer's clock rather than by the completion of the previous frame.

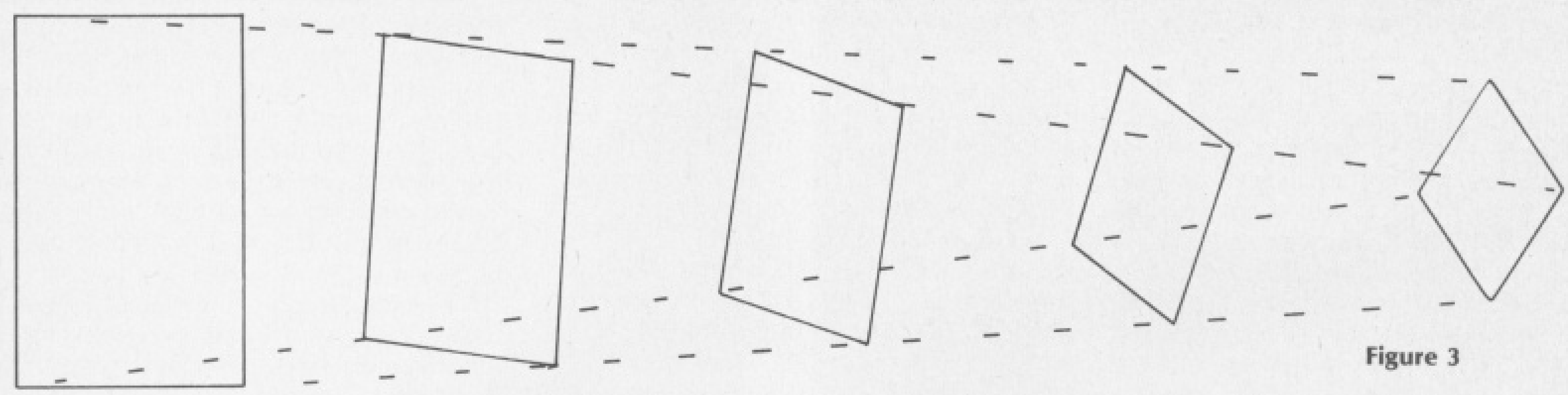


Figure 3

Program Listing

```
10 N=4: F=4
20 DIM XF(N), YF(N), XL(N), YL(N)
30 FOR K=1 TO N
40 READ XF(K), YF(K)
50 NEXT K
60 DATA 10, 100, 60, 100, 60, 150, 10, 150
70 FOR K=1 TO N
80 READ XL(K), YL(K)
90 NEXT K
100 DATA 220, 10, 230, 20, 220, 30, 210, 20
110 GOSUB 500: REM PREPARE HI-RES SCREEN
120 FOR I=0 TO F+1
130 FOR J=2 TO N
140 X1=(XF(J-1)*(F+1-I) + XL(J-1)*I)/(F+1)
150 Y1=(YF(J-1)*(F+1-I) + YL(J-1)*I)/(F+1)
160 X2=(XF(J)*(F+1-I) + XL(J)*I)/(F+1)
170 Y2=(YF(J)*(F+1-I) + YL(J)*I)/(F+1)
180 GOSUB 2000: REM DRAW LINE (X1,Y1)
TO (X2,Y2)
190 NEXT J
200 X1=(XF(N)*(F+1-I) + XL(N)*I)/(F+1)
210 Y1=(YF(N)*(F+1-I) + YL(N)*I)/(F+1)
220 X2=(XF(1)*(F+1-I) + XL(1)*I)/(F+1)
230 Y2=(YF(1)*(F+1-I) + YL(1)*I)/(F+1)
240 GOSUB 2000
250 NEXT I
260 END
500 POKE 53272, PEEK(53272) OR 8
510 POKE 53265, PEEK(53265) OR 32
520 FOR I=8192 TO 16192: POKE I, 0: NEXT I
530 FOR I=1024 TO 2023: POKE I, 22: NEXT I
540 RETURN
1000 RO=INT(R/8): CO=INT(C/8)
1010 L=R AND 7
1020 BIT=7 - (C AND 7)
1030 BYTE=8192+RO*320+CO*8+L
1040 POKE BYTE, PEEK(BYTE) OR 2^BIT
1050 RETURN
2000 DX=X2-X1: DY=Y2-Y1
2010 IF DX=0 THEN 2070
2020 FOR C=X1 TO X2 STEP SGN(DX)
2030 R=INT(Y1+(C-X1)*DY/DX)
2040 GOSUB 1000
2050 NEXT C
2060 RETURN
2070 C=X1
2080 FOR R=Y1 TO Y2 STEP SGN(DY)
2090 GOSUB 1000
2100 NEXT R
2110 RETURN
```

Figure 4 — The Program

THE COMMODORE SHOW, KNOWN AS the PET Show by us Old Timers, is an annual event eagerly awaited. What new hardware and software will emerge this year? Which way is Commodore going, and, this year, is survival going to be an issue? These are questions uppermost in the minds of thinking visitors to the Novotel Hammersmith.

These questions are made more poignant this year, when we know that the absence of Jack Tramiel at the top of Commodore in the United States, and his re-emergence as the head of Atari, with the possible intention of taking revenge on those who were responsible for disposing of him, is making executives look over their shoulders! Furthermore, the recent sudden "amicable" departure of the top U.K. executive is another straw in the wind for anxious executives.

Finding the Novotel is the first problem for newcomers. Taxi drivers, usually up to date, do not recognise the fact that the old Cunard Hotel is now under new French ownership! The first thing we find is that the show is on one floor only this year. We remember that last year's northern show was cancelled at relatively short notice and we wonder. We hear that just before this show, potential exhibitors were offered stands for no fee at all, and we wonder some more! Is Commodore cutting back on P.R. expenditure, as well as top personnel?

At the time of writing, Apple has just closed two factories in the United States, making 1200 people redundant. Here at home Sinclair seems to be going through a traumatic period, with Robert Maxwell bailing out the company, and forcing Uncle Clive to step down as Chief Executive. Worrying times indeed, so the marketing boys must get it right! However, remember the VIC. It sold two million units and it's memory available was minute compared with contemporary machines. A brilliant marketing success.

What about the Plus/4 and the C16? These have not been well received, although Guru Jim Butterfield maintains that they are good machines which have been underrated. Nobody at Commodore seems to want to talk much about these machines, save to say that the bundling process will continue unabated. The Plus/4 will now be bundled with an accounting package from IMPEX, a 1541 disk unit, and a MPS 801 Dot Matrix Printer, at a saving of £198.

Existing users of the 64 are to be tempted with a package which enables them to save £201 on a disk drive, a modem, the disk-based software. Alternatively, they offer 1541 disk units, MPS 801 Printer, and the Easyscript Word Processor for a saving of £214.

There is one apparent certainty – the price of the 64 will not come down! However, new buyers are to receive a cassette unit, and International Soccer game within the current recommended price of £199.

another "instrument". The Sampler, which showed how the amateur will soon be able to produce tapes similar in style to the current hit "19" was equally impressive. These products are near completion but not yet finished.

This was the story when visiting other stands too. The Graham Gooch Cricket Game launched by Audiogenic was on show, but not for sale. It looked a pretty good game. A crowd was often present around the Melbourne House stand, where their new Karate game was being played. The graphics on this were really good, and its attractions were enhanced by the opportunity to play against the World Karate champion.

Celebrities were much in evidence this year. The show was opened by two actresses from the new James Bond film, and Graham Gooch was on hand on Sunday morning. Jeff Minter was busily putting his Psychedelia programs through their paces on a variety of machines, including (heresy, this) an Atari! These programs produce a light show which you program yourself to flash along with your Hi Fi system. Really impressive! Especially so since you can try out your patterns and record them for future playback, perhaps at a party!

First Software had an impressive display of books and software, all translated from german Databecker products. Their books dealt with a variety of aspects of the Commodore 64, from machine code to graphics. In addition, they had an impressive Compiler, called, misleadingly enough, "Basic 64"! This is worth examining if you want to compile BASIC programs into real machine code, or if you want to compile programs using extensions to BASIC such as Master, Simon's Basic, Victree and so on.

COMMODORE

To the Commodore stand! Here we find displays of the much-announced and previewed Commodore 128. There it is, as large as life, with programs running, and the very smart three speed (automatic gearbox?) 1571 disk drive as well. Attempts to find out when this will be in the shops are, as usual in the micro-computer business, rather fruitless, but September, or at least by Christmas seems to be the best guess.

A Unix-type machine, the Commodore 900, is around but prices are very hush hush. Very high resolution graphics, multitasking, and much mousework are a feature of this machine. Is Commodore going back into the business sector, after its great success with games machines? What about the Amiga? Guarded comments seem to amount to this; Gail Wellington, Commodore's dynamic chief of Software (Europe) has been despatched to the United States as a trouble-shooting "Shaker and Mover" to get the Amiga out as soon as possible. What will it look like? Nobody knows, because the Marketing people will package it in whatever way seems likely to bring in the sales.

Commodore PCs are also much in evidence at the show, although the hard disk version is not in the shops yet. All the new gear looks very good and functions well. The PCs can be seen to operate the Flight Simulator perfectly, which is normally taken as a good indication of compatibility.

A Press Launch of the International Tennis, attended by Roger Kitter, the Television Actor who appears in a commercial as a certain aggressive young tennis player, was absolutely hilarious. The game itself following on the immensely successful International Soccer, and the recently launched International Basketball complete a very interesting sporting trilogy.

The preview of future music programs was equally impressive. In addition to showing the programs which play Beatle music, pop songs, and also classics, the same team of programmers and musicians demonstrated a Sound Synthesiser and Sampler. It was fascinating to hear how you could modify the sounds produced by your synthesised trumpet until satisfied, and then turn your attention to

Phoenix had a range of books for the 64, plus a very good Cribcard, containing all those references which you waste so much time looking for in reference works!

C. Itoh were showing a new version of their 105 cps. tractor/friction dot matrix printer. Priced at only £240 and interfaced through a Commodore Serial connector, this provided full Commodore compatibility including graphics characters and reverse-field printing, in addition to a whole variety of enhanced printing capability, including Bit-image graphics.

Holt Saunders were showing a wide range of Shiva and "Compute" Books, including one on the Commodore 128!

Impex were showing their various interfaces for the 64, together with their Three-in-One Accounting package, recently purchased by Commodore to boost the Plus/4.

Handic were showing a range of software, together with some hardware add-ons, perhaps the most interesting of which was the sturdy Superbox, which enables you to use IEEE parallel Commodore devices with the 64, at their full speeds, and also to choose between three cartridges plugged into the sockets provided.

Precision Software had their latest versions of Superbase and Superscript for the 64, together with a new program called Supertype. This enables you to learn to touch-type with a continuous skill-rating.

Compunet was being promoted, not only on its own, but also by the addition of a three month free trial subscription to Compucard. This is a computer-based purchasing network which is usually accessed by telephone, but which can now be accessed by owners of the Commodore 64 and Modem.

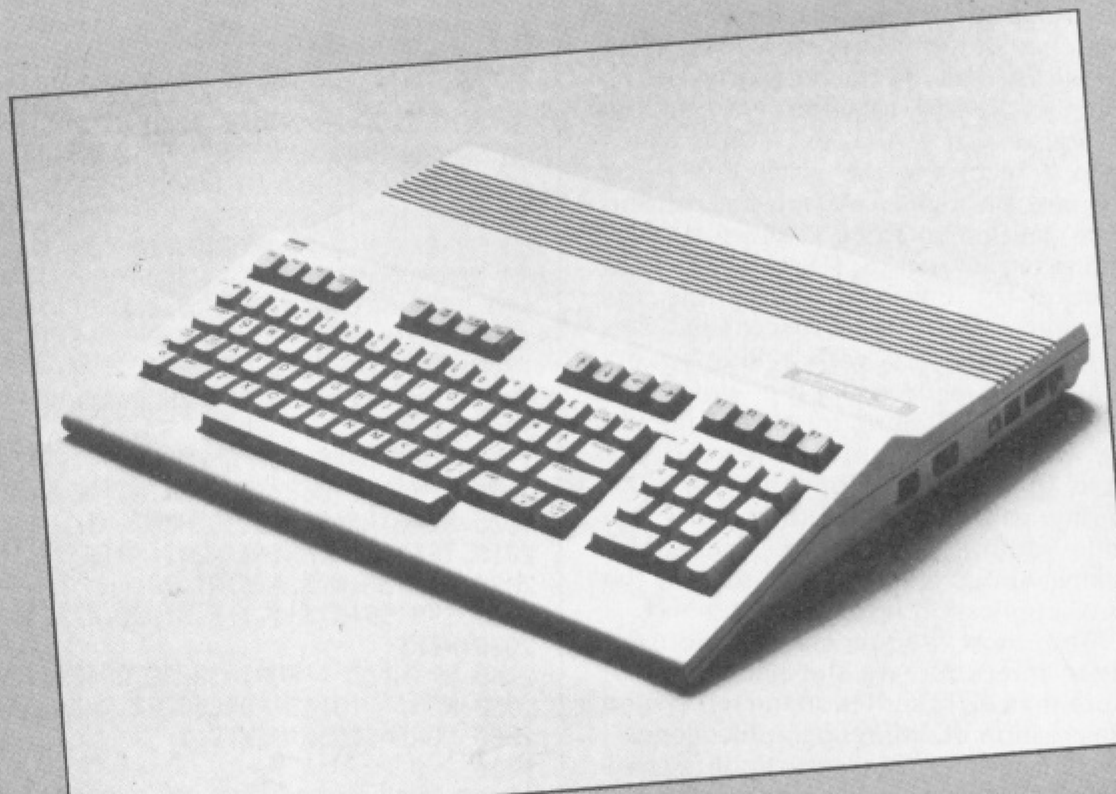
Connexions were showing their "Magic mouse" complete with graphics and operational software, which competed with the Datex MS1 Graphic Mouse on the Ram stand. Ram themselves were showing a variety of hardware add-ons, perhaps the most interesting of which was the add-on RAM/boards for the Commodore PC which were very competitively priced.

Domark Ltd were previewing their James Bond Game "A View To a Kill", together with a very dramatic display involving a car!



SHOW-

Supersoft had all their usual games and utilities on display, but pride of place went to The Music Synthesiser which had taken Andrew Trott, the author of the very successful "Mikro" Assembler some nine months to create. Very impressive, and attracting a lot of attention.



The Anirog Stand was also crowded with enthusiasts. They were showing their Voicemaster speech synthesiser, the "Jump Jet" game which is more of a flight simulator for potential Harrier pilots, and their very impressive Sprite Machine 64. This is a really interesting Sprite designer and animator package. The Mirrorsoft Company was showing at its most prominent in the Events room, where Spitfire 40 could be played as part of a competition, complete with a lifesize figure of a Battle of Britain Fighter Pilot.

It is not possible to cover the entire Show in a short report, there were hard disk drives, floppy drives which acted like hard disk drives, extremely high resolution graphics packages for CAD/CAM, the Firebird game Elite was at last on show, but not yet on sale, a robot, a turtle etc etc. My best advice to you is do not miss it next year, if you did this year!.

TOP DRAW

Allen Webb continues his series with an explanation of raster interrupts.

WELL LAST MONTH'S EPISODE WAS a little short and easy to type in. This month you're going to work for your living. Whilst the main loader will take a while typing in, I feel sure that you will find the investment in effort worthwhile.

This month's subject is the vital area of raster interrupts. I'm probably on fairly safe ground if I say that there aren't many games which don't use this handy feature to some extent. By the time you've read this article, you'll know why.

First a small dose of gentle background theory. In order to produce a picture, TVs and monitors have an electron gun which, under the influence of a magnetic field, scans the end of the tube. The picture information is carried down this electron beam. Each picture is built up as the electron beam scans across the screen as a sequence of raster lines. This all happens so quickly that you don't actually see the scanning. The 64, however, has a couple of registers at $D011 and $D012 which keep a record of the raster line being scanned at any given instant. You can also write a value to these registers and by setting bit 1 of register $D019 tell the 64 to perform an interrupt every time the specified raster line is scanned. This feature, combined with a little jiggery pokery to allow for the difference between the 50 hertz interrupt rate and the 60 hertz mains frequency and you have a raster interrupt routine. This routine can be directed to any machine code routine you choose. Since we're talking about scanning the screen, the usual application is to graphics.

The most frequent applications of raster interrupts are the generation of more than eight sprites on the screen and the creation of different graphics zones. I will ignore sprites since this application is tricky to implement and not necessary if you use a sensible approach to programming.

The basic of the program given here is to provide the means of specifying the

Program Listing

```
1 REM LISTING 2
2 REM
10 POKE56578,PEEK(56578)OR3: REM TWEAK BITS 0 AND 1 OF CIA #2
20 POKE56576,(PEEK(56576)AND252)OR1: REM SWITCH IN BANK 2
30 POKE648,132:PRINT"J": REM SCREEN AT $8400
40 REM
50 REM SET UP BANK 2

READY.
```

Demo 1

```
1 REM DEMO 1
2 REM
5 SA=49152
6 SYS SA
10 SC=6:N1=48:N2=40:GOSUB10000
20 SC=14:N1=39:N2=30:GOSUB10000
30 SC=3:N1=29:N2=22:GOSUB10000
40 SC=2:N1=21:N2=18:GOSUB10000
50 SC=9:N1=17:N2=13:GOSUB10000
60 SC=8:N1=12:N2=6:GOSUB10000
70 SC=7:N1=5:N2=1:GOSUB10000
100 FORI=1TO48:SYS SA+6,I,RND(1)*16,RND(1)*16,0,0,4:NEXT
1000 FORI=1TO48STEP2 :SYS SA+6,I,CO,16-CO,0,0,4:
1010 SYS SA+6,I+1,CO,16-CO,0,0,4:
1020 CO=CO+1:IFCO=16THENCO=0
1030 NEXT
1900 POKE 53282,6:POKE53283,2:POKE53284,7
2000 FOR I=0TO48STEP2:PRINT"■"
2005 R2=0:R1=0:IFI<18THENR1=1
2010 IFI>32THENR1=0:R2=1:PRINT""
2020 SYS SA+6,I,1,6,R1,R2,4
2025 SYS SA+6,I+1,1,6,R1,R2,4
2030 NEXT
2040 PRINT"J";:FORI=33792TO34791:POKEI,RND(1)*256:POKEI+21504,8:NEXT
2050 FORI=1TO100:POKE53282,RND(1)*16:POKE53283,RND(1)*16
2060 FORD=1TO50:NEXTD,I
9000 END
10000 FORJ=N1TON2STEP-1: SYS SA+6,J,SC,15,0,0,6:NEXT:RETURN
10010 SYS SA+3,SC,BC,R1,R2,ME:RETURN

READY.
```

TOP DRAW

Machine Code Loader

```
1 DATA76,9,192,76,173,193,76,70,194,120,169,127,141,13,220,169,1,141,26,208
2 DATA173,172,193,133,251,173,134,192,141,18,208,169,24,141,17,208,169,63
3 DATA141,20,3,169,192,141,21,3,88,169,16,141,67,3,169,147,32,210,255,169
4 DATA144,32,210,255,96,173,25,208,141,25,208,41,1,240,52,198,251,16,7,173
5 DATA172,193,133,251,198,251,166,251,189,230,192,141,32,208,189,182,192,141
6 DATA33,208,189,22,193,141,17,208,189,71,193,141,22,208,189,120,193,141,24
7 DATA208,189,134,192,141,18,208,138,240,6,104,168,104,170,104,64,76,49,234
8 DATA1,241,237,233,229,225,221,217,213,209,205,201,197,193,189,185,181,177
9 DATA173,169,165,161,157,153,149,145,141,137,133,129,125,121,117,113,109
10 DATA105,101,97,93,89,85,81,77,73,69,65,61,57,15,12,12,11,11,1,1,15,15,12
11 DATA12,11,11,1,1,15,15,12,12,11,11,1,1,15,15,12,12,11,11,1,1,15,15,12,12
12 DATA11,11,1,1,15,15,12,12,11,11,12,12,15,1,15,12,11,1,15,12,11,1,15,12
13 DATA11,1,15,12,11,1,15,12,11,1,15,12,12,11,1,15,12,11,1,15,12,11,1,15,12
14 DATA1,15,12,11,1,15,12,11,1,15,12,1,27,27,27,27,27,27,27,27,27,27,27,27
15 DATA27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27
16 DATA27,27,27,27,27,27,27,27,27,27,27,27,27,24,8,8,8,8,8,8,8,8,8,8,8,8
17 DATA8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8
18 DATA8,8,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20
19 DATA20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20
20 DATA20,20,20,20,20,20,20,20,48,32,213,193,169,0,141,66,3,32,10,194,238
21 DATA66,3,173,66,3,201,48,208,243,96,32,60,194,165,20,56,233,1,201,48,144
22 DATA2,169,47,141,66,3,96,32,60,194,165,20,141,61,3,32,60,194,165,20,141
23 DATA62,3,32,60,194,165,20,201,3,144,2,169,0,141,63,3,32,60,194,165,20,201
24 DATA2,144,2,169,0,141,64,3,32,60,194,165,20,141,65,3,96,172,66,3,120,173
25 DATA61,3,153,182,192,173,62,3,153,230,192,174,63,3,189,55,194,153,22,193
26 DATA174,64,3,189,58,194,153,71,193,173,67,3,13,65,3,153,120,193,88,96,27
27 DATA91,59,8,24,32,253,174,32,138,173,32,247,183,96,32,195,193,32,213,193
28 DATA76,10,194,255
29 REM
30 REM RASTER INTERRUPTS AEW (1985)
31 REM
32 FOR I=49152 TO 49743
33 READ X: T=T+X
34 POKE I,X: NEXT
35 IF T<>45356 THEN PRINT"ERROR IN DATA"
```

Parameter	Value	Effect
R1	0	Normal text
	1	Extended background
	2	Bit map
R2	0	High Resolution
	1	Multicolour
ME	0	$0000
	2	$0800
	4	$1000 Upper case
	6	$1800 Lower case
	8	$2000
	10	$2800
	12	$3000
	14	$3800

Raster Interrupts Commands.

SYS 49152	Activate interrupts
SYS 49155,SC,BC,R1,R2,ME	Change all of screen
SYS,49158,LN,SC,BC,R1,R2,ME	Change line LN

R1	R2	ME	Effect
0	0	94	Upper case text
0	0	6	lower case text
2	1	98	multicolour bit map at $2000
0	1	6	multicolour lower case text

line on the screen at which you want something to happen. We can, for example, tell the 64 to change the screen colour at specified places giving horizontal bands of different colours. More about that later.

The basic loader is all you need to set up the interrupts. If you have a machine code monitor and want to save it as a direct loading file, the routine occupies $C000 to $C24F. Three commands are available as summarised in Figure 1.

On activating the interrupts, you will be greeted with a rather diabolical effect of grey bands across the screen and border. This is simply to let you know something has happened. The parameters in the other two commands are described in Figure 2.

R1 chooses between normal text, extended mode and bit map. R2 selects normal text or multicolour mode. ME selects the character memory position. Some examples are shown in Figure 3.

The system detects the current bank setting so that you can use any bank you choose (the addresses for ME in table 2 must be adjusted by adding BANK NO * 16384). If you use the default bank 0, life is simple until you want to use redefined characters or bit mapping. To use these, you must raise the start of BASIC (very messy). It is better to use another bank. Listing 2 shows how to move to Bank 2. This Bank has an image of the character ROM so that it's easy to use. Don't forget to protect this area, however with:

POKE 56,132: POKE 46,132

This effectively reduces the memory for your programs to 37141 bytes.

The best solution, for the more knowledgeable, is to use bank 3 with the screen put at $C400. It will be necessary to copy a character set to $C800. With this arrangement, the area behind the Kernal ROM can be used for bit mapping with no loss in BASIC memory at all.

The second command in Figure 1 updates the entire screen. This enables you to rapidly change the screen. The screen is effectively divided into 49 strips. Their positioning is such that they correspond to the normal lines of characters. The last command enables you to alter any specified strip. Both of these commands can be called before to initialise the interrupts should you want to get an instantaneous display.

Initially, the system assumes that the screen is at its default value of $0400 or the corresponding position in the other banks. If you need to use a different position by poking 835 as follows:

Screen Offset	Value in 835
$0000	0
$0400	16
$0800	32
$0C00	48
$1000	64
$1400	80
$1800	96
$2000	128
$2400	144
$2800	160
$2C00	176
$3000	192
$3400	208
$3800	224
$3C00	240

The simplest way to get to grips with the routines is to try the two demonstration routines. NOTE that both of these use BANK 2 so you must run listing 2 first.

I hope you find these routines both versatile and fascinating. In the final part of this series, I will discuss the concepts of screen windows and provide a machine code routine for their manipulation.

Demo 2

```
10 REM DEMO 2
20 REM
30 REM BOTH BIT MAP MODES PLUS TEXT
40 BASE=10*4096: SCREEN=8*4096+4*256: SA=12*4096
50 SYS SA
60 SYS SA+3,2,14,0,0,4
70 PRINT CHR$(147)
80 FOR I=0TO319: POKE SCREEN+I,1:NEXT
90 FOR I=680TO999: POKE SCREE+I,1:NEXT
100 PRINT"[illegible]ABOVE WE HAVE MULTICOLOUR BIT MAP"
110 PRINT"[illegible]          AND BELOW HIGH RESOLUTION"
120 FOR LN=1TO15
130 SYS SA+6,LN,6,14,2,0,8
140 NEXT LN
150 FOR LN=34TO49
160 SYS SA+6,LN,6,14,2,1,8
170 NEXT LN
180 FOR I=BASE TO BASE+2560
190 POKEI,0:NEXT
200 FOR I=BASE+5440 TO BASE+8000: POKEI,0:NEXT
210 FOR X=0TO319: Y=SIN(X/16)*31+32: GOSUB230: NEXT
220 FOR X=0TO319: Y=COS(X/16)*31+168: GOSUB230: NEXT:END
230 ROW=INT(Y/8): CHAR=INT(X/8): LINE=Y AND 7: BIT=7-(X AND 7)
240 BYTE=BASE+ROW*320+CHAR*8+LINE
250 POKEBYTE,2↑BIT
260 RETURN
```

THE BASIC FACTS

A.P. & D.J. Stephenson explain the mysteries of searching and sorting.

The various methods of sorting data into some kind of order has occupied the minds of programmers for many years. Sorting data can be a lengthy process even to a computer and there are many different solutions to the problem. In fact, to cover the subject of sorting in any detail would justify a separate series of articles lasting several months. You may be asking why so many routines are necessary, surely there must be one better than the rest so why burden the literature with the others? Unfortunately, it is not as simple as this. Choosing the right one could depend on a variety of factors. Some solutions are easy to program and relatively easy to understand so it may be that these factors alone might influence the choice. For example, the solution known as the bubble sort is popular because it is simple. Indeed, the bubble sort is reasonably efficient providing there is only a small number of items to be sorted. However, when the number of items increases, the bubble sort takes far too long for most practical purposes because the sorting time is proportional to the square of the number of items. Thus, to sort 400 items could take sixteen times as long as to sort 100 items. In this article, we shall go straight to a highly efficient solution for sorting a large number of items when they are in random order. It is called the Quicksort and there is probably no significantly faster method for sorting a large randomly arranged list.

The Quicksort

The Quicksort algorithm, devised and named by C. HOARE in 1962, approaches the theoretical minimum sorting time which can be shown to be proportional to n $\log_2 n$, where n is the number of items. Now $\log_2 n$ is a weak function of n and does not

Program 12.1 Demonstration of Quicksort algorithm

```
10 REM DEMONSTRATION OF THE QUICKSORT
20 REM ALGORITHM (STRING ARRAY VERSION)
30 PRINT CHR$(147)
40 INPUT"SET UP HOW MANY STRINGS";B%
50 DIM A$(B%),S1%(16),S2%(16)
60 FOR N=1 TO B%
70 B$=""
80 A%=10*RND(1)+1
90 FOR Z=1 TO A%
100 K%=26*RND(1)
110 K$=CHR$(K%+65)
120 B$=B$+K$
130 NEXT
140 A$(N)=B$
150 PRINT A$(N)
160 NEXT
170 PRINT:PRINT
180 PRINT"SORTING"
190 PRINT:PRINT
200 TI$="000000"
210 H%=1:T%=B%:GOSUB1000
220 K%=TI/60+0.5
230 REM DISPLAY SORTED ARRAY
240 FOR N=1 TO B%
250 PRINT A$(N)
260 NEXT
270 PRINT
280 PRINT"SORTED"B%"STRINGS IN"K%"SECONDS"
290 PRINT:PRINT
300 PRINT"NOW SAVE A COPY OF THE SORTED STRING"
```

contribute significantly to the time so it follows that the sorting time approaches the ideal linear relationship. That is to say, it is almost directly proportional to n. For example, the time to sort 400 items can, under the best case conditions, be not much more than four times longer than the time to sort 100 items. Compare this with the bubble sort figures given in the previous paragraph.

The central idea behind the Quicksort is based on the observation that the speed of the simple bubble sort is quite acceptable providing the number of items in the list is small. It follows that if we have a large array and split it into two sublists containing different ranges of numbers and sort each list separately, we will save a lot of sorting time. To do this, we make an intelligent guess as to the array element that, hopefully, will have a value somewhere around the middle. This element will be known as the pivot. All array elements having a value less than the pivot will be placed above it in the lower half of the array and all elements having a value greater than the pivot placed in the higher half. If these two portions of the array are sorted separately, either side of the pivot, then the array will be completely sorted. The estimate of the pivot value is very important. For instance, we could choose the first array element or the last array element in a random array. However, if the list is partially sorted, as may occur in practice, the performance may be seriously degraded because the pivot will be too far offset from the median value to make the split worthwhile. It would be like cutting a pack of cards leaving about 4 on one side and 48 on the other. This effect can be reduced statistically by choosing the pivot as the mid point element of the array. There are, of course, many other ways of obtaining the pivot but we will employ this method. Incidentally, it is only fair to point out that, under worst case conditions, the sorting time can be as poor as that for a bubble sort but this is extremely unlikely to happen in practice.

One method of implementing Quicksort is to keep splitting down the main array holding the items until they each contain, say, 15 elements at most and then bubble sort them. Taking this idea to the extreme, if we carry on taking this partitioning process to the limit, then each sublist will eventually contain only one element – in which case there will be no need to employ a bubble sort at all!

To understand the Quicksort and to experiment with various numbers of items in an array, it is nice to have a program which includes facilities for filling it with random characters. We hope you will find Program 12.1 useful in this respect.

Using the program

The first screen prompt will be "Set up how many strings?". We suggest you try this first with a small number, say 10 in order to check if everything is OK. (It is conceivable that you may have made one or more keying errors when you entered the listing.) It will be easy to spot any out-of-order items because there is plenty of room on the screen to hold 10 of them. Once the number of items to be sorted have been entered, the program first

```
310 PRINT"ARRAY ON TAPE FOR TESTING THE
320 PRINT"VARIOUS SEARCH SUBROUTINES
330 OPEN 1,1,1,"ARRAY"
340 PRINT#1,B%
350 FOR N=1 TO B%
360 PRINT#1,A$(N)
370 NEXT
380 CLOSE 1
390 END
997 REM *
998 REM *
999 REM QUICKSORT SUBROUTINE
1000 SP%=0
1010 IF H%>=T% THEN 1130
1020 P$=A$(INT((H%+T%)/2))
1030 I%=H%:J%=T%
1040 IF A$(I%)<P$ THEN I%=I%+1:GOTO 1040
1050 IF A$(J%)>P$ THEN J%=J%-1:GOTO 1050
1060 IF I%<J% THEN T$=A$(I%):A$(I%)=A$(J%)
:A$(J%)=T$:I%=I%+1:J%=J%-1:GOTO 1040
1070 Q%=J%:R%=I%
1080 IF I%=J% THEN Q%=J%-1:R%=I%+1
1090 SP%=SP%+1:P%=H%:S%=T%
1100 IF Q%-P%<S%-R% THEN S1%(SP%)=R%:S2%(SP%)=S%:H%=
P%:T%=Q%:GOTO 1010
1110 S1%(SP%)=P%:S2%(SP%)=Q%:H%=R%:T%=S%:GOTO 1010
1130 IF SP%>0 THEN H%=S1%(SP%):T%=S2%(SP%):SP%=SP%-1:
GOTO 1010
1140 RETURN
```

displays the items in random order. The clock then starts and the sorting commences. At the end of the sort, the time taken is displayed. The program then arranges for the sorted list to be stored on cassette tape which means, of course, you will have to respond to the usual screen prompts for tape transfer. In case you may be wondering why we want to put the list on tape, it should be explained that the tape will be required for the next program which deals with binary searching.

After you are satisfied that the program works with 10 you should settle down to a marathon session, trying out successively larger numbers of items and recording the timings. Finally try it with a few thousand items to convince yourself that the Quicksort is a vast improvement on the primitive bubble sort. You will notice that successive timings on the same number of items can differ. This is understandable since the array is filled with random characters.

How the program works

Dimensioning

The array A$(B%) holds the list of string items. The stack requires two arrays, each reserving a conservative 16 locations, S1(16) and S2(16). These arrays are dimensioned in line 50.

Filling the dummy array

The random characters are generated by the nested FOR/NEXT loops in lines 60 to 130. The inner loop, amongst other things, ensures that only upper case letters are allowed to enter the array. Random numbers between 1 and 26 are generated in line 100 and the next line adds 65 to them which lifts them to the ASCII region for upper case letters.

Displaying the array items

The outer loop repeats the process for all array items and prints them out in the unsorted state (see line 150). The time clock is started in line 200. The sort routine requires the last and first array index to be included in the sort, called the head (H%) and tail (T%) which are assigned in line 210 before the call to GOSUB 1000. Quicksort thus has the advantage of sorting items within any chosen limits of the array. For instance by setting T% to 20, we may sort just the first 20 array elements.

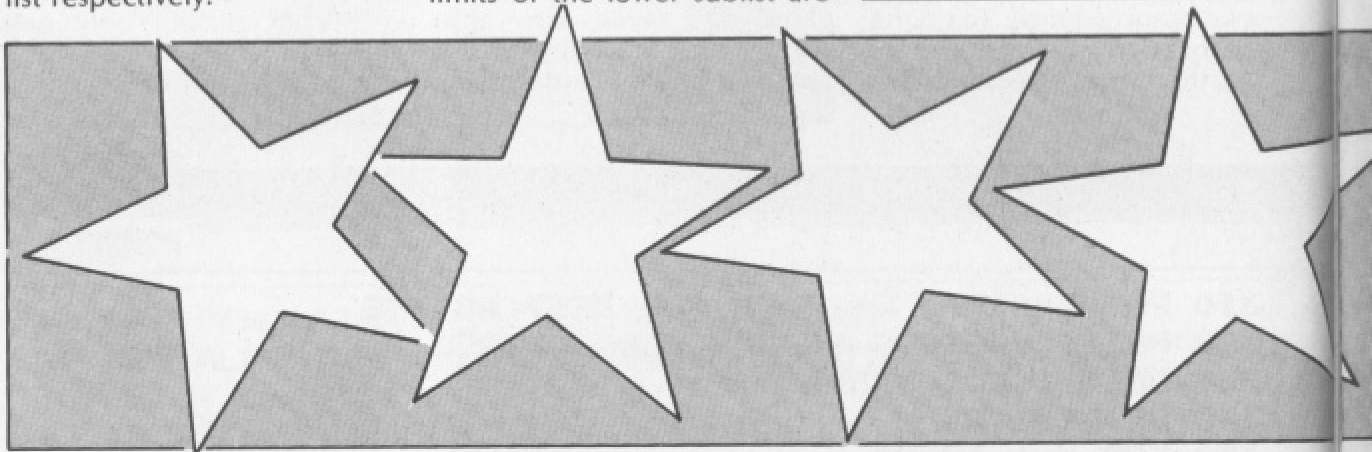
On returning from the subroutine, the sorted items are displayed by the FOR/NEXT loop, lines 240 to 260.

Quicksort subroutine

This occupies the bottom of the program from line 1000 onwards. As you can see, it is not exactly light reading so it will require more than the casual glance to unravel it all.

Line 1000: initialises the stack pointer SP% to zero.

Line 1010: Form an outer loop which executes repeatedly while the H%<T%. These variables represent the head and tail pointers of the current list respectively.



Line 1020: The pivot, P$, is obtained by adding the head and tail pointers (H% and T%) and dividing by two. Taking the integer value of the result will hopefully index the median value string of the list or sublist (see above).

Line 1030: Initialises the pointers I% and J% to start the scans from the head and tail of the current list.

Line 1040: The index I% scans the current list from its head until an element is found that is greater than or equal to the pivot string, P$.

Line 1050: The index J% scans the current list from its tail until an item is found that is less than or equal to the pivot string, P$

Line 1060: Provided the indexed I% and J% have not met or crossed the elements are swopped over so that they are in the correct half of the list. Further scans are then performed until another pair of elements are found in the wrong sublist.

Lines 1070 to 1080: When the indexes I% and J% eventually meet or pass (I%>=J%) the list is split into two sublists. All elements above I% will be less than or equal to the pivot string, P$, and all elements below J% will be greater than or equal to the pivot string. If both scans terminate with I%=J% then the element at this array position is equal to the pivot string, P$ and is placed in neither sublist. (It is already in its correct array position). On the other hand if the scans terminate with I%>J% then the items between I% and J% are all equal to the pivot string, P$, and are excluded from either sublist.

Lines 1090 to 1130: The stack pointer SP% is incremented ready for placing sublist limits on the stack. The array index limits of the lower sublist are P% and Q% (head and tail respectively) and R% and S% for the higher sublist. The head and tail parameters of the sublists yet to be stored are put on the stack. Thus if we are presently sorting the array between A$(P%) and A$(Q%) then R% and S% would be placed on the stack so the sublist A$(R%) to A$(Q%) could be sorted later. In practice it is better to put the longer sublist limits on the stack and process the shorter sublist immediately. This is the task performed in line 1100. Each time a list is further partitioned in the outer loop the process is repeated. On exit of the loop in line 1130, the sublists, whose parameters were placed on the stack, are taken in sequence (last in, first out) and sorted in a similar manner.

It is often stated that Quicksort uses a lot of memory because the program listing is much longer than, say, a simple bubble sort. Also it uses more variables and needs to employ a fixed stack area of memory. However, the extra memory used by the stack itself is not excessive. The number of stack levels needed by Quicksort is given by LOG2(N). Therefore to sort say 4,096 numbers the number of stack levels needed would only be LOG2(4096) =12.

To give an idea of the sort times to be expected see Table 12.1

Table 12.1 Execution times of Quicksort.

No of strings	Typical sort time (sec)
100	21
200	48
500	166
1000	474

Searching arrays

Searching for a particular item within an array is a common processing requirement, even more common than sorting. The problem is concerned with comparing items in the array with the search key until a match is found.

Sequential or linear search

This is the search algorithm most widely used because it is simple and obvious. It involves starting from the beginning of a list and sequentially comparing each element in turn with the search key in order that a match may eventually be found. If the end of the list is reached without finding a match the search is deemed to have failed. We used this simple technique in the filing program listed in the June issue of 'Your Commodore'.

Program 12.2 Comparison of linear and binary search methods.

```
10 REM COMPARISON OF LINEAR AND
20 REM BINARY SEARCH ALGORITHMS
30 PRINT CHR$(147)
40 PRINT"LOADING SORTED STRING ARRAY FROM TAPE"
50 OPEN 1,1,0,"ARRAY"
60 INPUT#1,B%
65 DIM A$(B%)
70 FOR N=1 TO B%
80 INPUT#1,A$(N)
90 NEXT
100 CLOSE 1
110 INPUT"ENTER SEARCH STRING";F$
120 IF F$="" THEN 110
130 INPUT"USE LINEAR OR BINARY SEARCH (L/B)";K$
140 IF K$<>"L" AND K$<>"B" THEN 130
150 TI$="000000"
160 IF K$="L" THEN GOSUB 1000
170 IF K$="B" THEN GOSUB 2000
180 T=TI/60
190 IF FL%=1 THEN PRINT"STRING FOUND AT ARRAY
POSITION ";J%
200 IF FL%=0 THEN PRINT"STRING NOT PRESENT"
205 PRINT"TIME TAKEN = "T" SECONDS"
210 INPUT"SEARCH AGAIN (Y/N)";K$
220 IF K$<>"Y" AND K$<>"N" THEN 210
230 IF K$="Y" THEN PRINT:GOTO 110
240 END
997 REM *
998 REM *
999 REM LINEAR SEARCH SUBROUTINE
1000 J%=0
1010 J%=J%+1
1020 IF J%>B% THEN FL%=0:GOTO 1050
1030 IF F$=A$(J%) THEN FL%=1:GOTO 1050
1040 GOTO 1010
1050 RETURN
1997 REM *
1998 REM *
1999 REM BINARY SEARCH SUBROUTINE
2000 LO%=1:HI%=B%
2010 J%=INT((LO%+HI%)/2)
2020 IF F$=A$(J%) THEN FL%=1:GOTO 2070
2030 IF F$<A$(J%) THEN HI%=J%-1
2040 IF F$>A$(J%) THEN LO%=J%+1
2050 IF LO%>HI% THEN FL%=0:GOTO 2070
2060 GOTO 2010
2070 RETURN
```

Sequential searching, although relatively easy to understand and program, is obviously slow because, on average, half the file will need to be searched before the required data is found. In other words, there will be on average, N/2 comparisons for N items in the search list. The worst possible case is, of course, when the required item happens to be the last one on the list, in which case there will be N number of comparisons.

The binary search

A much faster method of searching an array, provided it is first sorted, is called the 'binary' search. Before proceeding, it is worth mentioning that the word binary in this sense has nothing to do with the '1's and '0's normally associated with the word. It means binary in the sense of successive halving.

Assume the array has first been sorted into ascending order, the data item in the middle of the list is first compared with the item to be matched. If the item is smaller than the required item, the search continues in the first half of the array. If the item is larger, the search concentrates on the second half of the array. On locating which half, the process continues as before by first testing the middle item in that half. Eventually, by continually halving, and testing, the required data item is either found or declared to be non existent. On the

surface, this may seem a longer process than the simple sequential search but this is only because it has taken longer to explain. (As an analogy, a spiral staircase is easy to visualise but try explaining what it looks like to those who have never seen one.)

The equation of interest is

Average number of comparisons = LOG (N)

where N is the total number of data items to be searched.

This is a startling result and worth studying an example, if only to illustrate the superiority of the binary search over the simple sequential search. Assume we wish to locate a specific item from within a total list of 10,000 items. We will compare both methods

(a) Sequential

Average number of comparisons = N/2 = 10,000/2 = 5000

(b) Binary search:

Average number of comparisons = LOG(N) = LOG (10,000) = 13 (when rounded).

Even with one million items, the number of comparisons would only be about 20 whereas 500,000 would be needed with linear searching. Assuming each comparison in BASIC takes 20 milliseconds, this would mean a linear search time of 10,000 seconds (nearly three hours!). However, it is only fair to stress once more that a binary search can only be carried out on a previously sorted array, whereas the sequential search makes no demands at all on the order of the file items. If an array is small in size, it may not always be worth troubling to sort beforehand and it certainly would not be sensible to sort it just for the sake of using a binary search. On the other hand, if a file is to be accessed often and additions to the file are infrequent then binary searching is the ideal solution.

Demonstration program

Program 12.2 will allow you to judge for yourself whether the binary is superior to the linear search method because either may be used in the program. You will remember that you will already have a randomly filled dummy array already on tape, a residue from the previous program.

Using the program

The program begins by expecting you to load the array. Make sure that before running the program, that the tape is set to the correct position and all tape keys are OFF, otherwise there will be none of the customary screen prompts. Once the tape has been loaded, you will be asked to supply the search string. Next, you will answer the question whether you want to use the linear, (L) or binary, (B) method of searching. The search then begins. If the search is successful, the array position number of the matching item is displayed followed by the time taken to find it. It is worth trying this out with both methods many times over in order to be satisfied that the binary method is far superior. Try it with strings in several array positions including the first and last. You should have a look at the unsorted array positions in order to pick out in advance a few matching items. This can be easily done in direct mode. For example, PRINT A$(50).

How the program works

The body of the program is quite straightforward, requiring only an outline explanation. The first item on the tape is the number of items which is read into B% ready for DIMensioning the array in line 60. The FOR/NEXT loop which follows, reads the tape data into the array A$(N). The search key (the character string which is to be searched for) entered by the operator in line 110, is assigned to F$. Depending on whether the operator, in response to the prompt at line 130, enters L or B, either the linear or the binary search subroutine is called.

The linear search subroutine

This extends from 1000 to 1050. The loop counter is J% which is first initialised to zero before entering the loop and is then incremented each time round. The end of loop test, that all items have been checked, is at the top (line 1020). Also in this line, a flag, FL% is set to zero. The loop begins by comparing F$ with the first array item which will be A$(1). The loop continues to revolve until a match is found, at which point, the flat FL% is set to 1 and the loop exits prematurely by a branch to RETURN. After returning to the main program, lines 190 or 200 (depending on whether the flag was left at 1 or 0) will display either the item position, which will be in J%, or display the "String not present" message.

The binary search subroutine

This occupies lines 2000 to 2070. Line 2000 assigns the index numbers, LO% and HI% respectively, to the initial array limits. The next line is the start of the main loop and finds the mid point of the current sublist by simply halving the sum of the supplied limits LO% and HI% each time round the loop.

Lines 2020, 2030 and 2040 perform the comparisons.

Line 2020 tests for equality between the search string F$ and the middle array item. If the match is found, the flag, FL% is set to 1 and the subroutine returns.

Line 2030 tests if the search string is less that A$(J%). (This means if the ASCII code numbers are less, not the array numbers.) If they are, then HI% is then assigned to one less than the half way position. Line 2040 is similar except that it tests if F% is greater than A$(J%). If so, then LO% is assigned to 1 more than the half way position.

These three tests are carried out, each time round the main loop, until either a match is found or all data has been searched without success. The latter condition occurs when LO% becomes higher than HI% in line 2050 in which case the flag FL% is set to 0 before the RETURN.

Find out just what goes where with the first of Joe Nicholson's four part series for the C-16.

PROGRAMMING THE C16

THE C-16 USER MANUAL IS A FINE introduction to BASIC, but lacks a description of the many powerful facilities accessible outside of the standard BASIC commands. Instead, it refers you to the C-16 Programmer's Reference Guide which remains unpublished at the time of writing. This series of articles sets out to explain these extra facilities.

The Memory Map

As explained in the December issue of 'Your Commodore', much of the hardware of the C-16 is based on one large chip, the 7501 or TED chip, which combines a 6510 processor with a two channel sound generator, a first class graphics generator, and some other important functions.

To plan a machine code program, it is important to know the way in which the processor uses the available memory. The overall memory map of the C-16 is shown in Figure 1. The main partitions are as follows:

$0000-$07FF (0-2047)
2K of RAM used by the operating system. As on all 6502 based computers, ZERO PAGE is from $0000 to $00FF and the STACK is between $0100 and $01FF (256 to 511).

$0800-$0BFF (2048-3071)
TED attribute bytes. Used by the C-16 for the colour (Bits 0-3) and luminance (Bits 4-6) of the low resolution screen. As only 1000 of the 1024 bytes are used, addresses $0B8E-$0BFF (3048-3071) appear to be unused.

$0C00-$0FFF (3072-4095)
TED character pointers. These are the characters for the low resolution screen. Again only 1000 bytes are used, so addresses $0FE8-$0FFF appear to be unused.

$1000- (4096 -)
This is the area reserved for BASIC. In fact, BASIC starts at address $1001 (4097), as address $1000 (4096) must always contain 0. If high resolution mode has not been selected, BASIC can go up to address $3FFF (16383), but if it has been selected BASIC can only be written up to address $17FF (6143).

If high resolution mode has been selected, the area of memory between $1800 and $3FFF (6144 and 16383) is used as follows:

$1800-$1BFF (6144-7167)
Contains the luminance information for the Hi-res screen,

$1C00-$1FFF (7168-8191)
Contains the colour information for the Hi-res screen,

$2000-$3FFF (8192-16383)
Contains the Hi-res screen data.

$4000-$7FFF (16384-32767)
A mirror image of the bottom 16K of memory. Rumour has it that this space would have been occupied by an extra 16K of RAM, but perhaps Commodore thought this might be too competitive with the '64.

$8000- (32768-)
The Commodore-16's operating system in ROM.

$D000-$D7FF (53248-55295)
The two ROM character sets (upper case/graphics, and upper/lower case).

$FF00-$FF3F (65280-65343)
Registers to control the TED chip. These registers are used to control sound, graphics, timers and other important functions. A number of these registers will be explained in detail in later articles.

$FF81-$FFF3 (65409-65523)
The Kernal jump table. This contains jump statements to important routines in the C-16's operating system such as store or retrieve data on tape or disk, output text to screen or printer, scan the keyboard, update the system clock, etc. These routines function in the same way, and have the same entry points as the Kernal in the Commodore 64.

$FFFC-$FFFD (65532-65533)
These registers hold the address that the microprocessor will jump to on a Cold Start, ie, when the computer is first turned on, or when the reset button is pushed. This address is $FFF6 (65526)

$FFFE-$FFFF (65534-65535)
These registers hold the address that the microprocessor jumps to on a machine code BRK instruction. This address is $FCB3 (64691). A BRK instruction makes the C-16 jump into the Monitor with the message 'BREAK'.

The Plus-4 achieves 60K of RAM free for BASIC because it banks the top 32K of memory, switching out the operating system and switching in 32K of RAM. This memory banking is achieved using small machine code routines stored in RAM, which bank in the top 32K of memory, read or write to a byte of the memory and then bank the operating system back in. These routines are still in the C-16, and are called by the operating system whenever a byte of RAM in the BASIC area is to be read from or written to. This means that the C-16 is capable of expansion to give the same amount of memory for BASIC as the Plus-4. Also it may be one of the reasons why the C-16 SAVEs and LOADs slower than the C-64!

Where To Store Machine Code

Unlike the Commodore 64, there is no definite area in memory set aside for machine code. Code cannot just be popped into any free space however. When the operating system handles strings it continually fills up the free part of the BASIC area with garbage, overwriting even the best machine code Space Invaders game stored there. There are, however, three ways to overcome this:

1. Use the area below BASIC.

The following regions appear to be unused on the C-16:
$05F5-$0650 (1525-1629)
Covers the 'RAM areas used for banking.' These do not appear to be used on the C-16 (no doubt they are on the Plus-4) making the space available for machine code.
$065E-$06EB (1630-1771)
These were intended for some speech package, so if you don't happen to own one, this is also free for machine code.
$06EC-$07AF (1772-1967)
This is the BASIC run time (or GOSUB) stack. If your BASIC program does not have dozens of nested GOSUBs, then a large proportion of this memory is available also. As the run time stack writes downwards from $07AF, it is wise not to use the top part of this area. $06EC-$0760

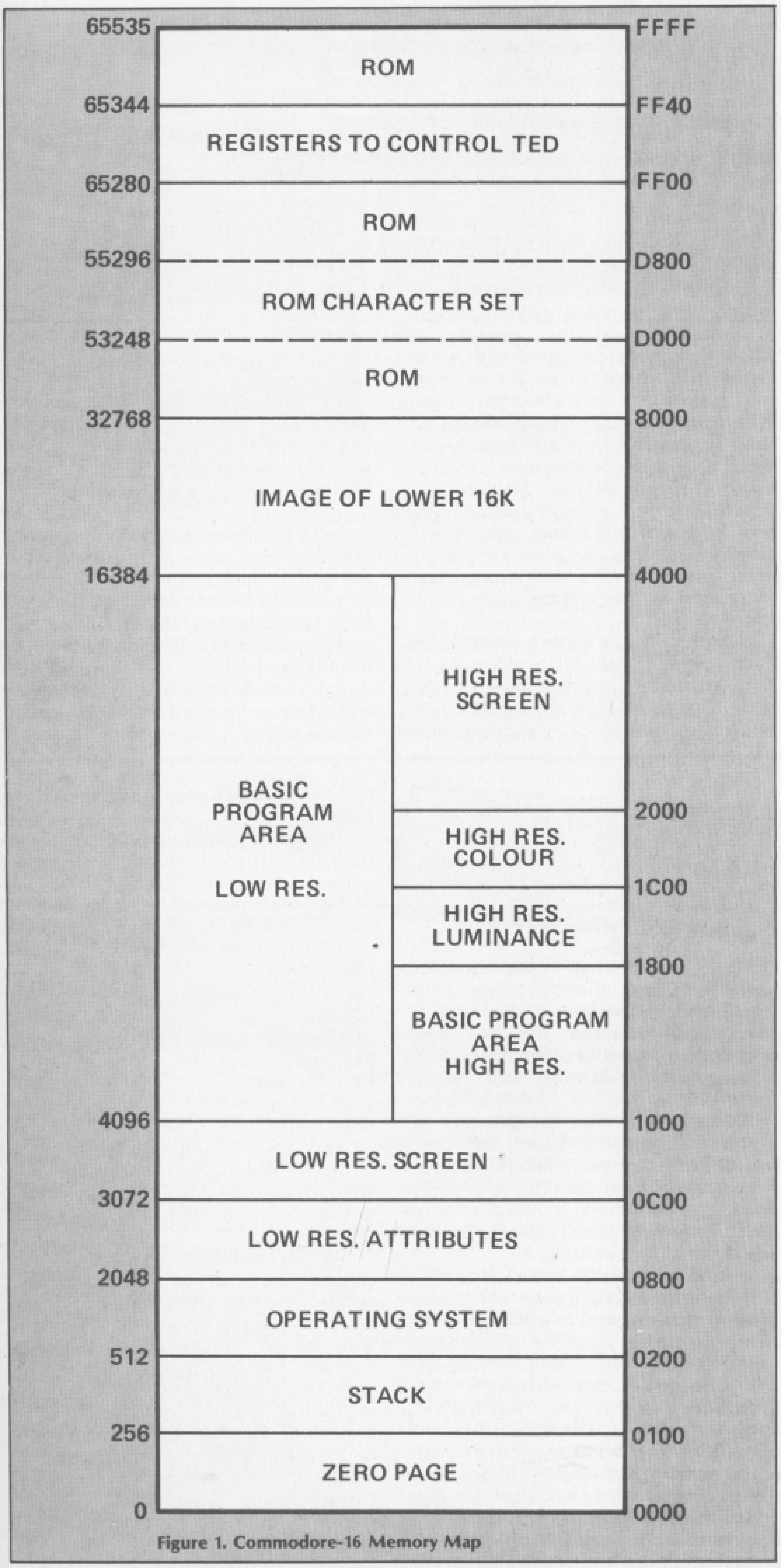


Figure 1. Commodore-16 Memory Map

(1772-1888) is as much as I would normally use.

Therefore, an area from $05F5 to about $0760 (1525 to about 1888, about 363 bytes) appears to be usable for machine code. On the Plus-4 from 1630 to 1888 would be available. On the C-16, the area between $05F5 (1525) and $06FF (1791) is not wiped when the machine is completely reset, making permanent routines, such as extensions to BASIC, possible.

2. Move up the start of BASIC.

This is an excellent place in which to store machine code as it allows machine code programs of virtually any length to be written to an area that cannot be touched by BASIC. Unlike lowering the top of BASIC (see section 3), it allows the use of both low and high resolution screens. Addresses $2B and $2C (43 and 44) contain the low byte and high byte respectively of the 'Start of BASIC' pointer. This initially contains $1001 (4097). To move the start of BASIC up 1K to $1401 (5121), therefore type:

```
POKE 44,20
```

The byte before the start of BASIC, initially 4096, but 5120 when BASIC is moved up 1K, must contain a 0 for BASIC programs to work. Therefore in this example type the following BEFORE moving the start of BASIC:

```
POKE 5120,0
```

Finally, it is always wise to perform a NEW command, to set the string pointers to their correct values. BASIC is now moved. All programs loaded after this will automatically load into the new address (including the C-16 Assembler recently published in this magazine) enabling machine code to be assembled straight into the free 1K block.

3. Move down the top of BASIC.

This has the disadvantage of limiting the user to either low resolution or high resolution screen memory configurations. To move the top of BASIC, the 'Highest address used by BASIC' pointer at addresses $37 and $38 (55 and 56) and the 'Bottom of string storage' pointer at addresses $33 and $34 (51 and 52) must be altered as desired. Finally a CLR command should be executed.

For instance in low resolution mode, to make 1K available at the top of memory between $3C00 and $3FFF (15360 and 16383), type the following:

```
POKE 56,59:POKE 52,59:CLR
```

Addresses 55 and 51 already contain 255 and do not need to be changed, ie, 59*256+255=15359. This instruction sets the top of BASIC pointers to one less than the start of the desired block. As 'CLR' is used it should be placed at the start of the program to preserve the variables.

Next month we shall be dealing with programmable graphic characters, one of the most important facilities not explained in the manual.

Software Spotlight



Timeslip
★ ★ ★ ★ ★
English Software Company
£6.95
Commodore 16 or Plus 4 — Joystick optional

DO YOU LIKE FLYING? OR PERHAPS you prefer underground tunnels, full of ghostly beings. On the other hand, you may be the sort of person who enjoys underwater exploration? Well, in this game you will need to do all three, in whichever order you like, and in each phase you will encounter enough hazards to last a lifetime!

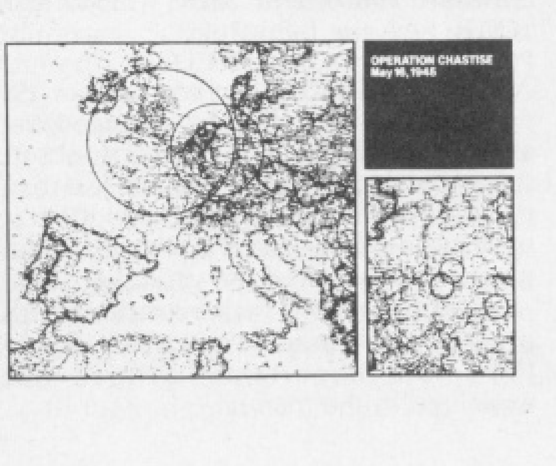
Timeslip owes something to Scramble-type games, but it gives a new and original twist to the theme which must surely make it a winner. The screen is divided laterally into three sections, each of which scrolls independently and very smoothly. In each section there are a dozen time-orbs (they look like clocks to me) which you must destroy in order to neutralise the rather frequent, worrying timeslips which threaten to destroy your planet.

Depending on the scenario you choose, you are equipped with a star-fighter, a submarine or just Shanks's Pony, and you have a very effective ray gun. Points are scored for each hazard you destroy, ranging from trees to cannon, but the most important factor is the time taken. You are allowed 24 "hours" to accomplish your mission and, although you have unlimited lives, you lose 30 precious minutes for each collision. In some mysterious manner you can gain extra time by shooting fuel pods and oil barrels.

Graphically, the game is quite superb. Each playing area is colourful and detailed, and no less than fifteen screens wide. There is no high-score table but this is a minor deficiency in a game whose programmer has worked miracles to fit it into 16K. The sound effects are limited, but perfectly adequate.

Of the two dozen or more C16 games I have seen, this is undoubtedly the best and I recommend it without hesitation – it just shows what can be achieved with skilful programming. English Software and programmer Jon Williams deserve success with it.





Dambusters
★ ★ ★ ★ ★
US Gold
£9.95
CBM 64 + joystick

THE LATEST OFFERING FROM US GOLD has been given the most impressive launch to date. This took place at the RAF Museum in Hendon and was even attended by a number of members of the original hastily-formed and heroic squadron.

The strategic effect of the raid on which the game is based has been disputed in recent years, but its impact on the morale of both sides has never been seriously questioned. It remains to be seen whether the game lives up to the real event and all its publicity.

By and large I think it succeeds.

I should say straight away that I think that the most enjoyment will come if you have read the history of the raid, either in Paul Brickhill's book, or Guy Gibson's own 'Enemy Coast Ahead". The peculiarities of the raid, involving two lights shining downwards from the bottom of the bomber, and a crude home-made range-finder for dropping the bouncing bomb will then be fully understood. Packaging is very good. The booklet contains reports by both the bomb's designer and the leader of the raid, all of which give a welcome air of realism.

During the game you play a series of roles, from pilot through navigator, gunner, bomb aimer etc.

You must plan your course, avoiding anti-aircraft fire. There is an intelligence report plus six scrolling maps of Europe to help you).

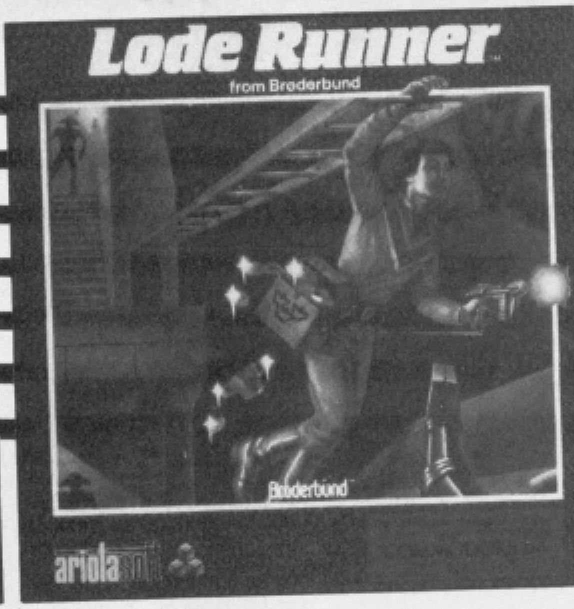
As Engineer you control engines (surprise!) – you can damage the engines with excessive revs!. If you have selected the Squadron Leader option, (in which you must make a successful take-off with your heavily loaded bomber), then the rudder trim is also your department.

Very good graphics of the quality of those in "Beachhead" accompany your attempts to shoot down night fighters and barrage balloons, whilst avoiding enemy "flak" too.

For successful pilots, (or those who choose the Practice Dam Approach option), the final attack must be skillfully done. If you keep height and speed right, and release the bomb at the right moment, you may manage to wreck the dam. You are then rewarded with a high-resolution picture, (loaded in after impact) of the dam giving way and the flooding of the valley commencing.

Great Value for money and a lot of fun. I was slightly disappointed with the graphics for the final approach, but that is nit-picking!

B.M.



Lode Runner

★ ★ ★ ★ ★

Ariolasoft

£9.95 cass/£12.95 disc

CBM 64

THIS IS AN IMPORT BY ARIOLASOFT, previously produced by Broderbund in the United States. The copyright notice for Broderbund is dated 1983, so we were a little concerned that the program may be old hat. Happily this is not so!

You play the part of a highly trained(?) Galactic Commando operating deep in enemy territory. A fortune in gold has been stolen from your people, and you are in the course of retrieving the gold. Hence the word "Lode" in the name of the game.

By running, jumping, climbing ladders and ropes, (rather a novelty this), you move from platform to platform. If life gets too difficult, you can always create new passage-ways by drilling through stone floors and barriers, with the aid of your lazer-gun!

There is a good demonstration at the beginning of the game, which you quit by pressing the joystick button, or any key except RETURN. Control is by joystick or keyboard. Users of the keyboard will be pleased that there is provision for slowing the game action down, by repeated pressing of "-". High-speed performers can speed it up by repeated pressing of the "+" key!

A good feature is the fact that you can pause the action by hitting RUN/STOP.

You are after all the gold chests which are scattered around. On each screen a ladder miraculously appears at the top when your mission is accomplished. For this achievement you are rewarded with bonus points.

The guards rush about carrying gold, so you must be pretty anti-social to get it away from them. Your trusty Laser comes into action again, by digging pits, into which the guards obligingly tumble. They get stuck in the pit, whereupon you may satisfyingly run over them. Additionally, they drop the gold. You must not delay too long, as the pit gets filled in, and the man re-appears at the top of the screen, Guards are able to climb out of pits which do not close around them, whereas you cannot!.

A high-score chart is maintained on the disc.

Many extra features make this a very much out-of-the-ordinary game. You can cheat your way onto later screens, if getting there legitimately is beyond your skill. Also you can add additional lives. Either of these manoeuvres means your score will not be allowed onto the high-score table; they are purely for practice!.

The best feature of all is that you can design your own game. If you are not satisfied with the 150 different puzzles and scenes, you can design as many new games as you like for yourself.

The kit of parts can be used to construct an infinite number of different screens, simply by using numeric keys to put diggable and undiggable floors, ladders, bars for hand-over-hand movement, gold chests, and enemy forces, wherever you wish. Very complete instructions are given which seem to be foolproof, even going so far as to advise you about only having one player on your screen, and saving the game onto your own data disc.

Graphics are good and sound quite good.

All in all this is an excellent buy and highly recommended.

Jump Jet by Anirog

★ ★ ★

£9.95 cass/£11.95 disc

CBM 64 + joystick

THE VOICE OF FLIGHT CONTROL crackles in my headphone "Clear for take-off Squadron Leader". Applying 100% engine thrust my Harrier Jump Jet slowly rises from the carrier's deck. At 100 feet I adjust the jet nozzles from vertical to 45 deg. forward thrust, raise the undercarriage and clear the carrier deck. Approaching 200 kts I apply full forward power and raise the flaps. A complete transformation has taken place and my Jump Jet surges forward. The airspeed indicator shows 400 kts so I throttle back to cruising power. The radar display shows an enemy aircraft to be eight miles away, slightly to port. I bank to intercept. Suddenly I feel very lonely. My hours of training are about to be tested to the full. Will I meet the challenge? Will I be one of those "Counted back"?

Jump Jet by Anirog has added to the ever-growing list of flight simulators for the 64. The program has an added 'gimmick' in that speech has been incorporated. It is this that lifts it over being just another flight simulator. The turbo program loads in 90 seconds and while you decide which skill level to select a catchy tune belts out. Depending on the level set, flight control informs you that you are "Clear for take-off Lieutenant/ Squadron Leader" and so on. Next, a bird's eye view of the aircraft on the carrier deck is provided and, having thoroughly read the flight manual, you successfully lift off. Above 50 feet, a side and end elevation of the aircraft and carrier are provided. This is essential to manoeuvre the aircraft back to the landing pad. Above 200 feet the cockpit view switches to sea and sky with dancing waves and racing clouds providing a good illusion of movement.

It is a shame that the horizon does not bank with the aircraft. The cockpit instruments are reminiscent of Flight Path 737, as is the way in which the aircraft has to be within certain parameters during take-off, flight and landing. A warning sounds if the aircraft is outside these parameters with the accumulation of too many warnings bringing the message "Mayday! I'm bailing out" and the end of that flight.

I was rather disappointed with the combat sequence. The enemy aircraft approaches head on and it is necessary to cover it with a gun-sight before firing a missile. If the enemy gets closer than two miles you will be destroyed and the Mayday message transmitted. In my opnion, a full-blooded dog fight, with each aircraft jostling for position, would have been more exciting.

The landing sequence, as one would expect, is the most difficult. Depending on the skill level, the conditions can vary from calm to mountainous seas and from calm to stormy weather. In the toughest conditions, the aircraft bounces around in a manner likely to drain the colour from the cheeks of the squeamish! No wonder it takes so long to train Harrier pilots!

As with all flight simulators, thorough reading of the manual, coupled with a mastery of joystick and key control, is required for a successful flight. Because the combat sequence is so tame, by today's standards, I doubt if this program will have lasting appeal to the younger player. If the price had been £2 less and/or the combat more exciting I would have given this program 4 stars.

J.F.

Software Spotlight



Chickin Chase

★
Firebird
£2.50
Commodore 64

THIS GAME WAS ORIGINALLY PRO-duced in France, but has now been translated into English. The game consists of two title screens, two small tunes, and one graphics screen.

Yes, just one screen to play the game upon!

Each of the title screens is accompanied by a rather short tune. The second screen shows a large high-resolution picture of a chicken which winks at you.

The object of the game is to defend the chicken house, and stop the animals eating the female's eggs by pecking at them. The enemies that you can encounter while defending the eggs are Hedgehogs, Rats, Stoats, Snakes and other egg loving animals.

Chicken Chase I found to be best suited to the younger age group, although I don't think that this was the original intention.

Either keys or joystick can be used to move you around the chicken house to repel the attackers.

As this game has only one screen it gets very repetitive, even for a small child! Even at its low price it is by no means up to the standard of some of the other low price software. Overall the game is somewhat weak.

P.D.M.

Zeppelin Rescue

★ ★ ★ ★ ★

IT IS A PLEASURE TO PLAY AN ARCADE type game which does not involve rapid movement. Piloting a Zeppelin or airship around the skies of Los Angeles trying to rescue people is not the simplest of tasks. This is particularly true when you are endangered by acid rain clouds which will instantly break through the envelope of your airship. You must also avoid hitting bridges, buildings and even your home base. The slow but inexorable progress of your airship means that you must anticipate the need to stop in good time and give the appropriate command. It must be rather like commanding one of those ocean going fuel tankers which take about a mile to stop. This game will be enjoyed by people who get their excitement from creative endeavour, namely rescuing people, rather than destroying them.

The game is available on disc or cassette; we tested the disc version which loaded perfectly on all occasions.

You also have the unusual choice of how many times you wish to play it. Also you can choose how many ships you wish to have for each game. In view of its difficulty, you will probably want the maximum number of four, at least to start with.

The joystick enables you to move the airship horizontally, vertically or diagonally. Somewhat strangely this last is achieved by moving the joystick twice, once in each direction making up the angle, that is hit North and East to go Northeast. This produces a fine sense of confusion. The airship has two speeds, the faster speed being induced by a second push of the joystick in the same direction. To stop you must touch the joystick once if you are travelling at low speed and twice if at high. If you hit it once too often, the airship will rotate on its axis before starting to move off in the opposite direction! Inexperienced pilots will find the realistic unresponsive nature of the airship takes some getting used to! Speed seems to be correct, and the engine note seems to be particularly realistic.

You have five different screens, each of them contains skyscrapers inhabited by panic stricken people, 48 in all. They are under threat from various environmental hazards and need to be rescued using the people scooper. This is a small hook at the bottom of the machine.

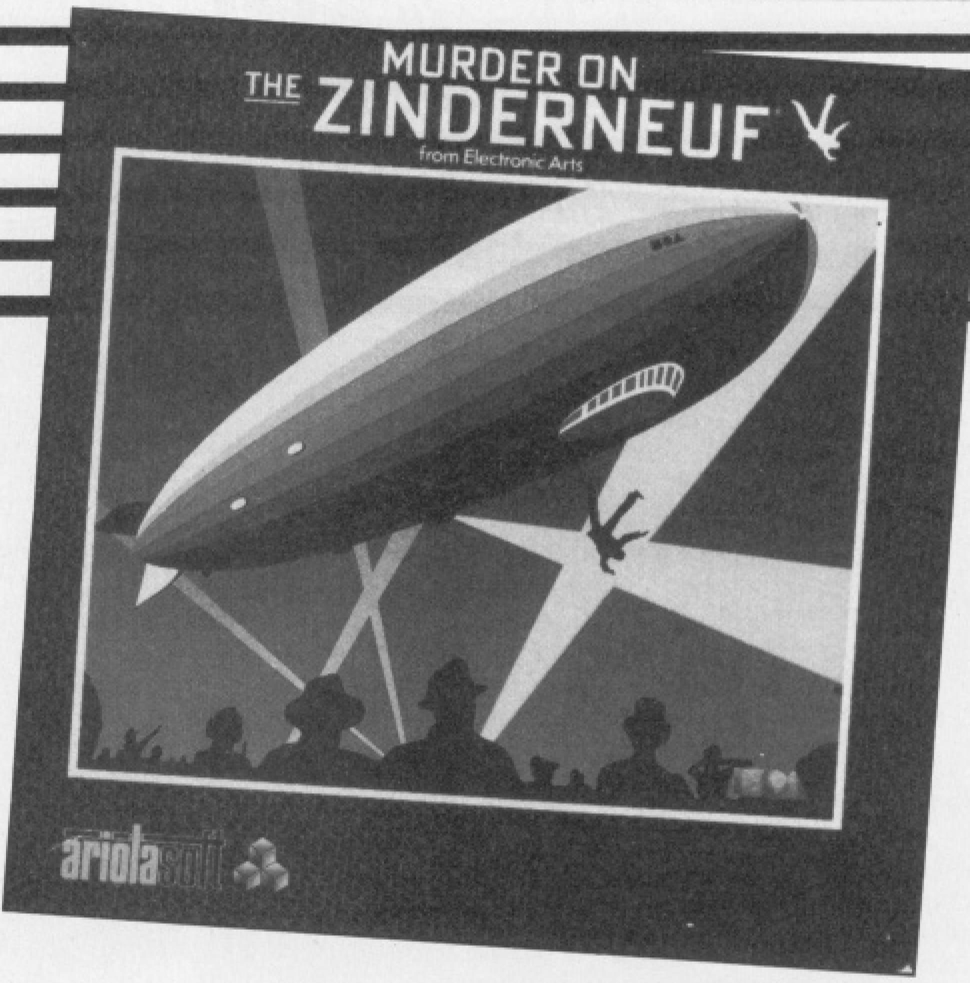
You can carry many passengers but you must eventually drop them off at the base to join people building a spaceship. You do this by exactly positioning the hook over a shoot which looks remarkably like a chimney.

During the game you are kept informed of the fuel situation and how many people are still in the city, on board the airship, and at the base.

You must economise on fuel because each time you touch the joystick you use up five gallons out of 1000, and of course time is running out. If you should manage to rescue 48 people you are supplied with another 48. A hero's work is never done!

One of the problems with designing a game is the compromise between making it difficult enough to maintain interest, whilst easy enough to encourage perseverence in the early stages. This has been well covered in Zeppelin Rescue, by providing a practice mode, in which the acid rainclouds are missing. thus you can learn to manoeuvre the craft before things get tricky.

This is a well designed game combining difficulty with slow action. There is a need for this type of game, for not everyone can respond to the more frenetic type of Arcade experience. The use of graphics and colour is of a high standard, and the limited use of sound is extremely realistic. More levels of difficulty would be an advantage.



Murder on the Zinderneuf
★ ★ ★ ★
Ariolasoft
£11.95 cass/£14.95 disc
CBM 64

Murder on the Zinderneuf is based on a good idea. Being placed in the 1930s, and in a confined space, it is very clearly set in Agatha Christie country.

The characters cannot escape your questioning, since the airship will not land for another 15 hours, when the trans-Atlantic journey ends. You have 36 minutes of real time to solve the mystery in this graphical adventure. You choose which detective you are going to be. The origins of the names are not difficult to see: Agatha Marbles, Inspector Klutzeau, Lieutenant Cincinnato etc.

You put your questions in one of a number of styles, and can wander about merely observing suspects' behaviour. You start off in the Dining Room. Once you have been told who is missing, you are on your own. You will probably soon wish you had chosen to be a different detective, because your effectiveness is determined by who you are! Clues are found by entering a room and moving round it. The scrolling graphics as you do this are good. Some of the clues may be downright misleading. This is no mere "Cleudo" type game.

You should not leave a room immediately you have found a clue, because there may be the most important clue of all in the room in addition. True to life you can only find the motive clue if your questions have elicited significant information. This is realistic, because generally motive can only be attributed to people after you have some information about them.

To interrogate a suspect you must "bump" into them.

IN THE EARLY STAGES, YOU QUESTION people at random, but later you will have to wander all over the airship to find the suspect you want. You can use any one of five approaches in questioning. These are different for each detective, and the result of these approaches will vary according to the character of the detective whose role you have assumed! The quality and length of the answers you get vary according to who you are too!

You can ask three questions at a time. This process is shortened by the fact that you merely select a suspect, by scrolling through a list, and then assume that the question is asked in the appropriate way! You can ask about more than one suspect, but your style of approach is set for that particular encounter, from the start. You cannot question the same subject twice without having a go at someone else in between.

You can accuse a suspect whenever you feel you have enough evidence. If that suspect is guilty, AND if the suspect believes you have enough evidence to make the accusation stick, the game ends. You will get a rating dependent on your performance. Speed, a large amount of evidence found, and a small number of wrong accusations will give a high rating.

When your journey ends, you can have one last go at a Final Accusation. The suspect's room is searched for clues, and if you are right your reputation as a detective will be restored, but not greatly.

All in all this is a fun simulation, with good graphics and reasonable use of sound. If you are fed up with Shoot-em-ups, this will fill in some happy hours.

Jet Set Willy II
★ ★ ★ ★
Software Projects
£8.95
CBM 64

MY HOPES WERE RAISED WHEN I READ that this was not so much a sequel as a reworking of the original. If, like me, you found Willy's first foray into the Jet Set too difficult to contemplate, then rest assured this is easier fare without losing the underlying cunning of the original game. Add to this the many extra screens and the potential should set your trigger finger twitching.

For the many who may not have met Jet Set Willy I, the story takes place after a wild party to celebrate Manic Miner Willy's big strike. His wife, Maria, wants the house cleaned up before midnight or else Willy can't go to bed.

Part II takes place under similar circumstances except that Willy has been in hospital while little green men extended his house, which could account for the inclusion of a spaceship. The house is full of a dazzling array of hazards, platforms, ropes and ladders must be negotiated to complete the clean-up mission.

In all there are over 100 rooms some of which can only be accessed by the more 'enterprising' space traveller after indulging in a pastiche of another game involving a well-known bell-ringer.

Although the music is less ambitious than the original game, the graphics are just as good, if not more varied. With so many rooms to negotiate it will take many hours of enjoyment and frustration before a suitable map is compiled. One word of warning: beware of the toilet!

Why do Software Projects insist on using their ill-conceived colour coded protection system on this game? Being red/green colour blind, the most common form of colour blindness, means that I have to get someone else to select the code to run this wretched game, and it's about time a different selection of colours was employed. **E.D.**

Software Spotlight



Gogo the Ghost
★ ★
Firebird
£2.50
CBM 64 + joystick

A GAME WITH 150 SCREENS, AT £2.50, amazing! This game does have 150 screens, and it is hard to get through even one of them!

The object of this arcade/adventure, is to rescue the GoGo's dream princess. This is done by cleverly guiding your ghost through room after room of danger and evil. This is by no means easy, because besides having to avoid the walls that are around, you also have to avoid the many different species of monster that are there to prevent your getting to the princess. Some of the ways that seem to be possible to get to, are in fact inaccessible, and may in the process of your attempting to get there, cause you to lose a life or two!

The graphics are colourful, but not picturesque. The ghost is well drawn, and monsters too!

Every room has a number, and some have passwords. When you start to play you are asked for a password, and you can either type one in, or press RETURN. If you just press RETURN, then you will automatically start the game at screen one. Entering the correct password for one of the screens will start at that screen. The instructions tell you one of the passwords, and the front of the cover picture shows another!

You can collect various aids on your journey. If you are in a desperate situation, you can keep the fire button pressed down, which will make you invisible for a short while.

The screen maintains up-to-date information ratings for you about Life, Power and Time. You win points by collecting piles of gold dust as you pass from room to room. Winning is achieved by passing through the well-hidden Room 149 to room 150.

Well worth the money.

Review Up 'n' Down
★ ★ ★ ★ ★
US Gold
£9.95
CBM 64

THIS IS A SEGA GAME MARKETED IN England by US Gold. You are driving your car along a series of roads with 90 degree bends and many intersections. Your aim is to collect flags which are liberally laid along your route. This is not easy because you are hindered by a number of other drivers. Collisions with them result in the loss of one of your four lives.

The only way to rid yourself of this nuisance is to press the Fire button on your joystick, (or the appropriate key if you have selected the keyboard option), and jump above these enemies and land upon them. They then obligingly disappear after a minor disintegrating explosion.

Phantom bedsteads and other strange looking objects can pass through these other cars and you must avoid them.

The terrain varies, there is for instance a mountainous section of the course, which must be tackled with care. If you approach too slowly, your car will roll downhill backwards!

At the start you choose between Easy, Medium or Hard levels, and one or two player game, plus of course, joystick or keyboard.

You must keep your wits about you in this scrolling game. You are likely to find yourself in a dead-end, or going off the track if you are not careful. You will then lose a life. You can leave steering to your robot driver, but must change direction and accelerate and decelerate yourself. Speed control is very important, since jumping can only be resorted to when you have sufficient straight road in front of you not to go off track.

Similarly it is important to make sure there is no collision before you can carry out your jump.

There are three tracks in all, and since you can control the speed of movement of your car, and therefore the speed of scrolling, you can play at your own speed. The sound and music are good, and the graphics are well up to standard.

This game may not sound very much when described, but believe me, it is totally addictive, even when played by a very experienced, and therefore somewhat blase 13-year old game expert.

Highly recommended.





Ghetto Blaster
★ ★ ★ ★
£8.95
CBM 64 + joystick

GHETTO BLASTER IS UNUSUAL IN THAT althought it is an action game, you do not do anyone an injury.

You are Rocking Rodney and must dash about Funky Town delivering ten tapes for your employer. However, life is not too simple because you have to keep all the local inhabitants happy by making them dance. This is none too easy, because you must play your Ghetto Blaster and fire musical notes at them. The louder your machine is playing, the further your notes fly so that you can get them dancing from a greater range. Unfortunately, your batteries don't last long (You know the feeling?) and you must get new ones to complete the task. There is no point in craftily switching off the volume to save power, because your score of people whom you have already got to dance is lost!

There is a map provided, but you had better memorise the district, because you are kept too busy to refer to it. You must avoid being caught by the beat-walking policeman, and encounters with a very persistant Tone-deaf Walker are best avoided too, since this charmer will damage your Blaster! You must then call in to have it repaired!

The scoring in the game is simple. You either make it or you don't! This has a serious effect on the continuing playability of the game.

The action takes place over the top of a very accurate representation of a ghetto blaster, complete with tape hubs turning, rev counter, battery and volume indicator, the lot!

There is a very good demo with music. The music your machine plays covers ten different tunes, played very well.

All in all I liked this game a lot. It shows off how very good 3D High-Res Graphics can be, and uses the sound chip very well. As a demonstration program to impress your friends it scores highly. However, lacking as it does any way in which you can return to the game again-and-again to try to beat your previous scores, I have a feeling it will be a nine-day-wonder. Maybe when you get tired of it you can swap it with a friend!

Subsunk
★ ★ ★ ★
Firebird
£2.50
CBM 64

ANOTHER CHEAP GAME FROM FIREbird, but is it any good? Well, this game is a text/graphics adventure and a good one at that.

You are Seafarer Gazette's ace reporter, and you are in a nuclear submarine trapped on a sea-bed. The object is to send a message to GHQ for help. This may sound like a piece of cake, but I must emphasise that this is no mean task.

The sub contains a number of locations in which you will find an object, or more than one, and a few of these are useful in your effort to send the message. There are plenty of them to make it hard to decide which ones to use.

The graphics are well drawn, and appear on screen in no time at all.

There is a wide-ranging vocabulary which can be used to aid your effort to get help. This vocabulary contains most of the words which you expect to be able to use whilst playing your adventure, and a few more which have only been in the very best adventures, for example, there is 'Attach', 'Dismantle' and 'Fire'.

I was rather pleased to see that you could use abbreviations for directions and for obtaining a list of the possessions that you are carrying, and the ability to save the state of play at any point, for reloading later if you failed is a handy addition to any adventure.

This adventure has some hints and clues which can be found if you look hard enough! The vocabulary that is shown in the instructions you get with the game, is by no means complete...there are plenty of other words you can use, to get the result you are looking for.

All in all this is a pleasing adventure to play. The relatively small playing area makes it suitable for novice adventurers, and it even had some humour in it too!

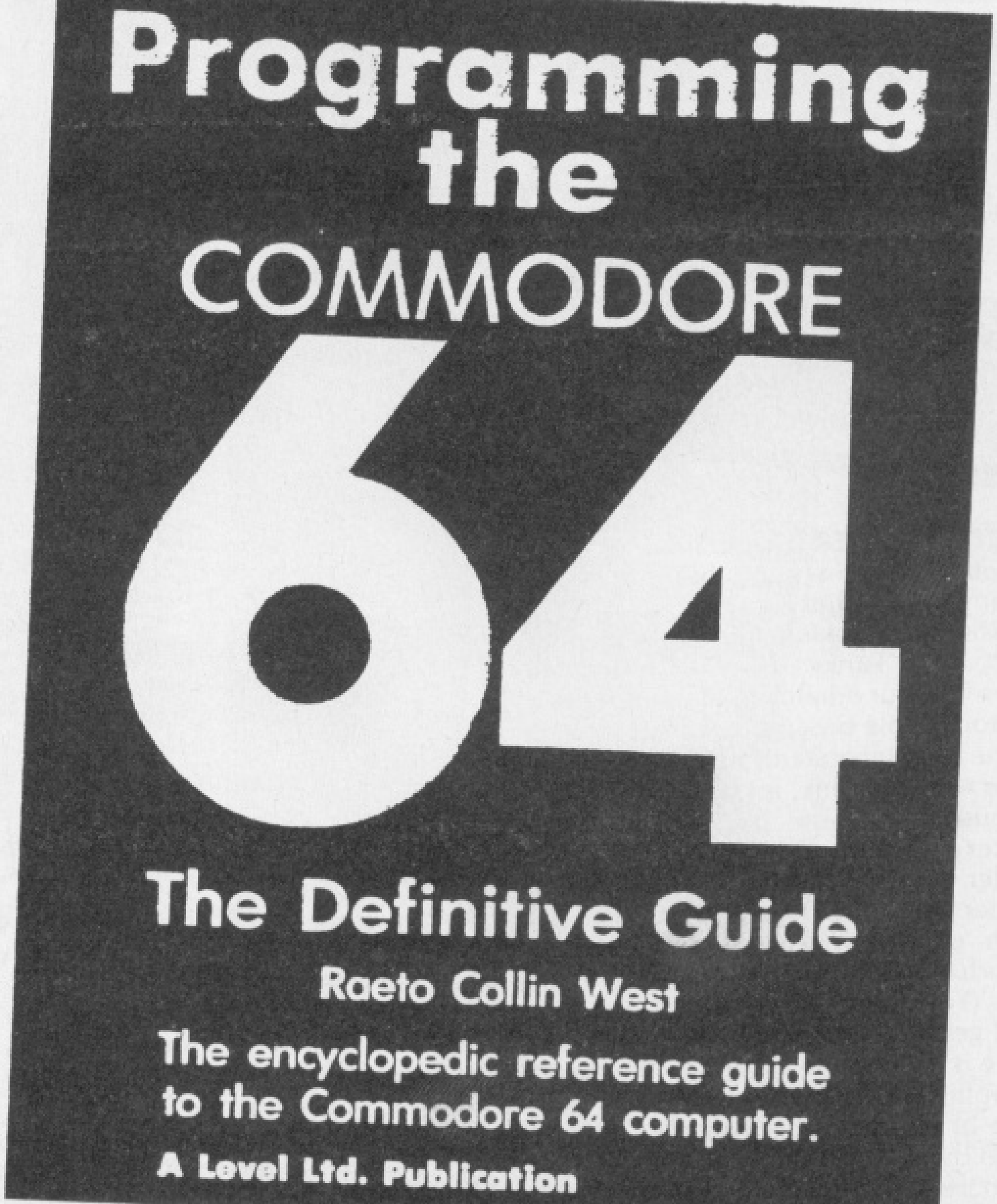
Good value at the price.

PDM

REFERENCE

This month Barry Miles has a little something for both the newcomer to Commodore machines and the old hand.

Title:
Programming the Commodore 64
Author:
Raeto Colin West
Publishers:
Level Ltd. c/o Biblios Distributors Star Road, Partridge Green, Horsham, West Sussex.
Price:
£14.90 + 10p P&P



WHEN RAY WEST BRINGS OUT A NEW book, knowledgeable users of Commodore machinery at once take an interest. The reason is not hard to find. The very large sales, and world-wide accolades poured on "Programming the Pet/CBM" guarantees curiosity. Has he once again produced an encyclopaedia which enables you to relegate all other reference books to a far corner of the bookcase? Is the new book really the "Definitive guide to the Commodore 64", as the publishers claim?

Firstly let us see what exactly you receive for your money. The book runs to 610 pages including the index, and costs £14.90. In addition you can buy a disk or two tapes containing all the programs within the book, for £9.40, and £10.40 respectively.

There is a school of thought which suggests that it is good for your soul, or at least for your understanding for you to type in the programs yourself. It is claimed that you will get a better idea of how the code operates that way. I would dispute this. It is quite difficult enough to try to enter programs in accurately, especially if they have many DATA statements in them, without trying to understand them at the same time. Studying the printed version of the program in the book is likely to be much more fruitful. In any case, most of us want to get cracking using new facilities, and not to be held back by tedious typing.

The first two chapters are an introduction to the book and to the machine.

The Basic Reference Guide follows, which is likely to be the section of the book most-referred to by readers. Introductory material is followed by a detailed analysis of every Basic keyword. Each keyword is covered in whatever degree of detail is necessary. Its Type, Syntax, Modes, Token, Abbreviated entry, and Purpose, are all spelt out, and then a number of examples follows. The examples are fully annotated, so as to be understood by beginner and experienced users alike. A very useful feature is the cross-referencing to the contents of other chapters where relevant. This saves much fruitless searching, and avoids repetitions in the text. Especially attractive is cross-referencing to machine-code ways of doing something that is being shown in Basic. Similarly, the details about LIST include reference to programs which carry out UNLIST and TRACE. Similarly, if you are reading about NEW, you are told where to find a piece of code which will carry out a rescue when you have accidentally convinced the Basic interpreter that the old program has been removed from memory. All Basic Error messages are given, with helpful explanatory notes, at the end of this chapter.

Chapter 4 covers "Effective Programming in Basic". This is a highly welcome facility, usually missing from books of this type. It covers flowcharting, System design, and (again usually neglected), File Structure. The section on Serious and Less-serious Programming introduces the ideas of menus, documentation, ease of modification, easy data input.

This section draws attention to unusual characteristics of Basic, which create pitfalls for the unwary and/or inexperienced. Speeding-up BASIC is covered, although I would have preferred to see a little more detail. However, once

LIBRARY

again cross-referencing to other chapters comes to your aid.

Chapter 5 covers the architecture of the 64, and gives information on programming the Complex Interface Adapters. If you think the CIA is an intelligence network, then the section on investigating the CIA's will help to demystify the subject. A section on resetting, and autostaring leads into a discussion of commercial software, in cartridge, and on disc and tape.

The next chapter covers Advanced Basic. In addition to showing how Basic and its variables are stored, you are exposed to the special locations and features of Basic. Full details are given of the operation of the keyboard buffer.

A machine-language program is offered for programming Function keys. You are encouraged to modify the manner in which the 64 operates in a whole host of ways. You want to make certain keys repeat if held down? You are shown.

However, the real meat comes when the section "Dictionary of Extensions to BASIC" is reached.

Unlike the book on the PET/CBM, this volume gives a lot of Basic routines, and fewer machine-code ones. Three factors appear to have influenced this. Firstly there is the recent publication of a book of Machine-language Routines by Mr. West's American publisher, which gives machine language alternatives, secondly there is the fact that BASIC routines are more readily understood, and thirdly the book could be published sooner if Basic routines were included, simply because the debugging time is reduced!

That said, you are able to Append Basic program lines, have line numbers provided automatically, renumber selected sections of your program, chain program segmented together, and carry out a whole host of other esoteric activities at will. A variety of sorts is given, and this is a most valuable chapter.

Chapter 7 brings you into the area of Machine-Language. "Supermon" is provided in an Appendix, for those who do not have a monitor available. The introduction offers short machine language programs to get your feet wet. Addressing modes are then dealt with, with admirable clarity, and after a description of Op-codes, you are taken on a guided tour through various useful machine-language techniques. e.g. two-byte operation, loops, two's complement arithmetic, and probably most important of all, Debugging machine-language programs. The use of monitors, and assemblers rounds off this chapter.

Next comes "Machine-language methods specific to the 64. Including the use of Kernal routines, using both ROM-routines, and the RAM which is hidden under ROM, modifying BASIC, Vectors and Interrupts.

Chapter 9 deals with mixing Machine-language and BASIC.

Chapter 10 gives the entire Vocabulary of the 6510 chip, aided and abetted by helpful notes.

Chapter 11 is a fully annotated memory-map for the 64 and the VIC, covering the first new hundreed RAM locations, the BASIC ROM, and the KERNAL ROM.

Chapter 12 is a full coverage of graphics.

This is a minor masterpiece of condensation. It includes a cross-reference table of Key, CHR$ value, POKE value and a picture of the graphic itself.

Screen scrolling is covered, as is character editing, and of course, Sprites. However, as we might expect the sprite coverage includes such exotica as extending of sprites available. (A program using 32 sprites is given), animation, and smooth motion.

Sound is given the same thorough treatment in chapter 13. A very detailed analysis of the SID chip is followed by a music theory and music programs. These are pretty lengthy, and if you are interested, they will push you towards buying the tapes or disc!

Tape storage is given the full treatment in the next chapter, including copy protection (creation not breaking!),.

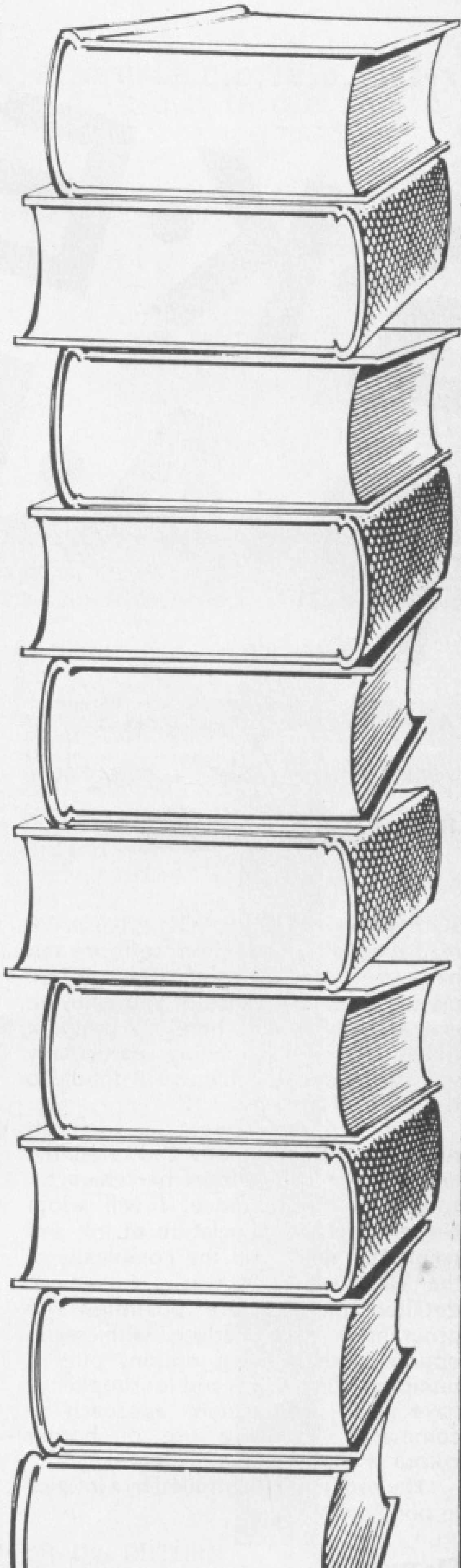
Disc activities are covered in chapter 15. Useful programs abound. Problems with disc drives are examined, and the programs on the disc which comes with the 1541 Disc drive are looked into.

Changing device number, in both software and hardware is covered, Sorted directories can be printed using one of the utilities provided. File handling in Machine-language is covered.

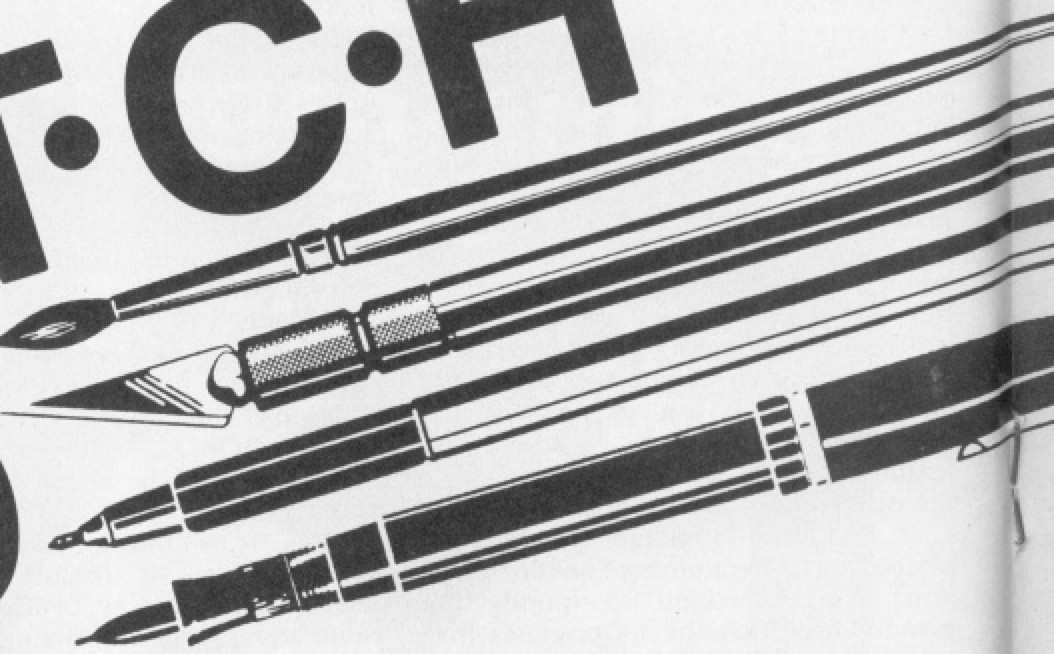
The final chapters cover other peripherals including printers, plotters, joysticks, paddles etc. An example of the thoroughness of this section shows when we are told how much an Atari Paddle varies in use from a Commodore one, and how to use the RS232 interface.

The book finishes with 18 Appendices, covering ASCII codes, Commodore ASCII codes, 6502/6510 op-codes, Dec/Hex conversion tables, etc. etc.

There is no doubt that the serious user of the 64 will find this the sort of book which is referred to again and again, and in which forgotten or missed material will be found on every reading. Highly recommended!



S·K·E·T·C·H P·A·D



Allen Webb brings you a really useful little sketch pad for your 64.

SO FAR IN THIS ISSUE YOU WILL HAVE read about all sorts of clever software and hardware for the creation of artistic masterpieces. For those of you with the energy to type it in, here is a program which, whilst not being particularly sophisticated will enable you to doodle to your heart's content.

The program operates in high resolution bit map mode and offers the limitation of two colours per character space. For convenience, I will adopt Uncle Clive's nomenclature of ink and paint. This does limit the complexity of the colours you can use, but more detailed pictures are possible. The program is menu driven with seven options. The drawing options offer a number of operations and for simplicity I have used a consistant approach to commands. Extensive use of border colour is made to ease matters.

The program is controlled by a joystick in port 2 only.

Draw

The option enables free hand drawing and manipulation of individual points. Press fire button to toggle between pen up and pen down.

Pen down...cyan border...draws or erases.
Pen up...white border...cursor moves without altering picture.
Draw...black cursor...press D
Erase...red cursor...press E
Clear screen...press HOME key.

With the pen down, the movement of the joystick/cursor is drawn or erased. With speed set at 1 you get a solid line, with higher speeds you get dotted lines.

Speed

Changes speed of travel. You can choose from 1 to 9 pixels per step.

Lines

Initial border is dark blue (command mode). In this mode you can move the cursor and perform other commands.

Erase/draw and clear screen as for draw mode. There is no need for pen up, so I've omitted it.

To draw a line:
1. Move cursor to one end of the line and press Fire once. The border will go light blue. A dot is drawn to show the end of the line.
2. Move cursor to other end and press Fire. The line will be drawn.

Circles

Command mode has a black border. All commands are used as for Lines. To draw a circle:
1. Place the cursor at centre point and press Fire. The border will turn one shade lighter, and the centre will be marked.
2. Move the cursor to the point where the circle will cross the horizontal axis due east from the centre. Press Fire. The border will turn one shade lighter, and the point will be marked.
3. Move the cursor to the point where the circle will cross the Y axis, ie due north of the centre. Press Fire, and the circle will be draw. The centre dot is then erased.
Using this routine any shape of ellipse can be drawn.

Air Brush

Yellow border.
This command allows you to shade areas with dots. The command fills a square area, with the cursor at its top left corner, with a number of random dots. Two box sizes are available, 16 by 16 and 8 by 8 pixels. Draw/erase work as before.

To draw with the brush, press fire. To move the cursor without drawing release fire.

Brush Parameters

This enables you to specify how many dots per squirt (1 to 255) and to choose the size of spray area.

Colours

This allows you to redefine the ink and paper colours. All drawing actions update the area concerned with the current colour. Careful use of erase in draw mode will allow you to paint areas of paper.

To enter status mode press F2 when in any drawing mode. To exit speed, brush parameters status and colour options, press any key. To return to main menu from a drawing mode, press F1.

Program Listing

```
10 DATA0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,63,243
20 DATA255,0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,0,12,0,0
30 DATA0,0,0,0,0,176
40 FORI=0TO63:READX: POKE16384+832+I,X:NEXT
50 GOSUB2380
60 POKE56,64:DX=1:DY=1:IN=0:PA=1:AD=49152:SYS AD,IN,PA:DF=1:UF=1:BS=1:BD=50
70 POKE53287,0
80 REM
90 REM      MENU
100 REM
110 SYS AD+9 :POKE53269,0:POKE 24568,13
120 PRINT"[CLEAR]":POKE53280,6:POKE53281,6
130 PRINT"[DOWN][DOWN]"TAB(13)"[WHITE]C64 SKETCH PAD"
140 PRINTTAB(13)"[c T][c T][c T][c T][c T][c T]
[c T][c T][c T][c T][c T][c T][c T][c T]"
150 PRINTTAB(15)"1. DRAW"
160 PRINTTAB(15)"2. SPEED"
170 PRINTTAB(15)"3. LINES"
180 PRINTTAB(15)"4. CIRCLES"
190 PRINTTAB(15)"5. AIR BRUSH"
200 PRINTTAB(15)"6. BRUSH PARMS"
210 PRINTTAB(15)"7. COLOURS"
220 GETI$:IFI$<"1"ORI$>"7"THEN220
230 ON VAL(I$) GOTO 280,680,740,1270,1570,1770,1870
240 END
250 REM
260 REM DRAW
270 REM
280 CO=3:IFUF=0THENCO=1
290 GOSUB1940
300 IFDF=0THENPOKE 53287,2
310 IFDF=1THENPOKE 53287,0
320 GOSUB610
330 GOSUB470
340 IF PEEK(197)=14 THEN DF=0:POKE 53287,2:GOTO330
350 IF PEEK(197)=18 THEN DF=1:POKE 53287,0:GOTO330
360 IF PEEK(197)=4THEN110
370 IF (JV AND 16) =0 AND UF=1 THENPOKE53280,1:UF=0:GOTO330
380 IF (JV AND 16) =0 AND UF=0 THENPOKE53280,3:UF=1:GOTO330
390 IFPEEK(197)=51 THEN GOSUB1040
400 IFPEEK(197)=5  THEN GOSUB1080
410 IF UF=0THEN320
420 GOSUB610
430 SYS AD+12,XP,YP,DF:GOTO330
440 REM
450 REM JOYSTICK ROUTINE
460 REM
470 JV=PEEK(56320)
480 JP=15-(JVAND15)
490 IF JP=1ANDYP>DY-1THENYP=YP-DY:RETURN
500 IF JP=2ANDYP<200-DYTHENYP=YP+DY:RETURN
510 IF JP=4ANDXP>DX-1THENXP=XP-DX:RETURN
520 IF JP=8ANDXP<320-DXTHENXP=XP+DX:RETURN
530 IF JP=5 AND YP>DY-1AND XP>DX-1THEN XP=XP-DX:YP=YP-DY:RETURN
540 IF JP=6 AND YP<200-DYAND XP>DX-1THEN XP=XP-DX:YP=YP+DY:RETURN
550 IF JP=9 AND XP<200-DYAND YP>DY-1THEN XP=XP+DX:YP=YP-DY:RETURN
```

Program Listing (cont.)

```
560 IF JP=10 AND XP<320-DX AND YP<200-DY THEN XP=XP+DX:YP=YP+DY
570 RETURN
580 REM
590 REM UPDATE DRAW CURSOR
600 REM
610 XC=XP+12:YC=YP+41:POKE 53248,XC-INT(XC/256)*256
620 IFXC>=256 THEN POKE53264,PEEK(53264)OR1
630 IFXC<256 THEN POKE53264,PEEK(53264)AND254
640 POKE 53249,YC:RETURN
650 REM
660 REM CHANGE SPEED
670 REM
680 PRINT"[CLEAR]":INPUT "SPEED 1 (SLOW) - 9 (FAST)";DX
690 IFDX<1ORDX>9THEN680
700 DY=DX:GOTO120
710 REM
720 REM LINE
730 REM
740 GOSUB1940
750 IF PEEK(197)=4THEN110
760 IF PEEK(197)=14THENDF=0:POKE53287,2:GOTO750
770 IF PEEK(197)=18THENDF=1:POKE53287,0:GOTO750
780 IFPEEK(197)=51THENGOSUB1040
790 IFPEEK(197)=5THENGOSUB1080
800 POKE53280,6:GOSUB470:GOSUB610
810 IF(JVAND16)>0THEN750
820 SYS AD+12,XP,YP,DF:X1=XP:Y1=YP
830 POKE53280,14:GOSUB470:GOSUB610
840 IF (JVAND16)>0THEN830
850 X2=XP:Y2=YP:FLAG=0
870 XD=ABS(X2-X1):YD=ABS(Y2-Y1)
880 IFYD>XD THENFLAG=-1:TEMP=X2:X2=Y2:Y2=TEMP:TEMP=Y1:Y1=X1:X1=TEMP:GOTO870
890 X=X1:Y=Y1
900 IFX2<X1THENX1=X2:X2=X:Y1=Y2:Y2=Y:GOTO890
910 YS=SGN(Y2-Y1):SLOPE=-XD
930 FORX=X1TOX2
940 XC=X:YC=Y
950 IFFLAGTHENYC=X:XC=Y
960 IFXC<320ANDXC>=0ANDYC<199ANDYC>=0THENSYS12*4096+12,XC,YC,DF
970 SLOPE=SLOPE+2*YD
980 IFSLOPE>0THENY=Y+YS:SLOPE=SLOPE-2*XD
990 NEXT
1000 GOTO750
```

Program Listing (cont.)

```
1010 REM
1020 REM CLEAR SCREEN
1030 REM
1040 SYS AD,IN,PA:POKE24568,13:XP=0:YP=0:GOSUB610:RETURN
1050 REM
1060 REM STATUS SCREEN
1070 REM
1080 SYS AD+9:BC=PEEK(53280):POKE53280,6:POKE53281,6:POKE53269,0
1090 PRINT"[CLEAR][WHITE][RVSON]STATUS...                            "
1100 PRINT"[DOWN]PAPER COLOUR [RVSON]  ":POKE55389,PA
1110 PRINT"[DOWN]INK    COLOUR [RVSON]  ":POKE55469,IN
1120 PRINT"[DOWN][DOWN]PEN SPEED..."DX
1130 PRINT"PEN...";
1140 IF UF=1THENPRINT" DOWN":GOTO1160
1150 PRINT" UP"
1160 PRINT"INK...";
1170 IF DF=1THENPRINT" DRAW":GOTO1190
1180 PRINT" ERASE":POKE198,0
1190 PRINT"[DOWN]AIRBRUSH DENSITY";BD
1200 PRINT"[DOWN]AIRBRUSH SIZE ";:IFBS=0THENPRINT"SMALL":GOTO1220
1210 PRINT"LARGE"
1220 GETI$:IFI$<>" "THEN1220
1230 POKE 53280,BC:POKE53269,1:SYS12*4096+6:RETURN
1240 REM
1250 REM CIRCLES
1260 REM
1270 CO=6:GOSUB1940
1280 IF PEEK(197)=4THEN110
1290 IF PEEK(197)=14THENDF=0:POKE53287,2:GOTO1280
1300 IF PEEK(197)=18THENDF=1:POKE53287,0:GOTO1280
1310 IFPEEK(197)=51THENGOSUB1040
1320 IFPEEK(197)=5THENGOSUB1080
1330 POKE53280,0:GOSUB470:GOSUB610
1340 IF(JVAND16)>0THEN1280
1350 SYS AD+12,XP,YP,DF:CX=XP:CY=YP
1360 POKE53280,11:GOSUB470:GOSUB610
1370 IF(JVAND16)>0THEN1360
1380 SYS AD+12,XP,YP,DF:XR=ABS(XP-CX)
1390 POKE53280,12:GOSUB470:GOSUB610
1400 IF(JVAND16)>0THEN1390
1410 SYS AD+12,XP,YP,DF:YR=ABS(YP-CY)
1420 IFXR>YRTHENCH=.9/XR:GOTO1440
1430 CH=.9/YR
```

Program Listing (cont.)

```
1440 POKE53280,15
1450 FORA=0TO2*[255]STEPCH
1460 X=SIN(A)*XR+CX
1470 Y=COS(A)*YR+CY
1480 SYS AD+12,X,Y,DF
1490 NEXT
1500 SYS12*4096+15,IN,1
1510 SYS12*4096+12,CX,CY,0
1520 SYS12*4096+15,IN,PA
1530 GOTO1280
1540 REM
1550 REM AIRBRUSH
1560 REM
1570 CO=7:GOSUB1940
1580 GOSUB610
1590 GOSUB470
1600 IF PEEK(197)=14 THEN DF=0:POKE 53287,2:GOTO1590
1610 IF PEEK(197)=18 THEN DF=1:POKE 53287,0:GOTO1590
1620 IF PEEK(197)=4THEN110
1630 IF PEEK(197)=17THENPOKE53280,1:UF=0:GOTO1590
1640 IF PEEK(197)=42THENPOKE53280,3:UF=1:GOTO1590
1650 IFPEEK(197)=51 THEN.GOSUB1040
1660 IFPEEK(197)=5  THEN GOSUB1080
1670 GOSUB610
1680 IF (JVAND16)>0THEN 1590
1690 BX=XP:IFXP>287ANDBS=1THENBX=287
1700 IFXP>303ANDBS=0THENBX=303
1710 BY=YP:IFYP>167ANDBS=1THENBY=168
1720 IFYP>183ANDBS=0THENBY=184
1730 SYS AD+18,BX,BY,DF,DD,BS:GOTO1590
1740 REM
1750 REM UPDATE AIRBRUSH PARAMETERS
1760 REM
1770 PRINT"[CLEAR]AIRBRUSH PARAMETERS[DOWN]"
1780 INPUT"DOT DENSITY 1-255";DD
1790 IFDD<0THENDD=1
1800 IFDD>255THENDD=255
1810 INPUT"[DOWN]BRUSH SIZE 0=SMALL, 1=LARGE";BS
1820 IFBS<0ORBS>1THENBS=0
1830 GOTO110
1840 REM
1850 REM CHANGE COLOURS
1860 REM
1870 PRINT"[CLEAR]COLOURS[DOWN]"
1880 INPUT"PAPER COLOUR";PA
```

Program Listing (cont.)

```
1890 IFBC<0ORBC>15THENBC=15
1900 INPUT"INK COLOUR";IN
1910 IFFC<0ORFC>15THENFC=15
1920 SYS12*4096+15,IN,PA
1930 GOTO110
1940 SYS AD+6
1950 POKE53280,CO
1960 POKE 53269,1
1970 RETURN
1980 REM
1990 REM MACHINE CODE
2000 REM
2010 DATA76,54,192,76,196,192,76,106,192,76,164,192,76,16,193,76,122,193,76,44
2020 DATA194,65,76,76,69,78,32,87,69,66,66,32,49,57,56,53,70,79,82,32,89,79,85
2030 DATA82,32,67,79,77,77,79,68,79,82,69,32,34,194,165,20,141,132,3,32,34,194
2040 DATA165,20,141,133,3,169,96,133,169,169,0,133,168,162,64,32,138,192,169
2050 DATA92,133,169,169,0,133,168,173,132,3,10,10,10,10,13,133,3,162,8,32,138
2060 DATA192,173,2,221,9,3,141,2,221,173,0,221,41,252,9,2,141,0,221,173,17,208
2070 DATA9,32,141,17,208,169,120,141,24,208,96,160,127,145,168,136,16,251,72
2080 DATA24,165,168,105,128,133,168,169,0,101,169,133,169,104,202,208,231,96
2090 DATA173,2,221,9,3,141,2,221,173,0,221,41,252,9,3,141,0,221,173,17,208,41
2100 DATA223,141,17,208,169,21,141,24,208,96,32,34,194,165,20,141,132,3,32,34
2110 DATA194,165,20,141,133,3,76,83,192,32,154,193,32,65,193,32,139,193,173
2120 DATA134,3,41,7,141,141,3,56,169,7,237,141,3,141,141,3,24,169,1,174,141
2130 DATA3,240,4,10,202,208,252,160,0,174,137,3,240,5,17,170,145,170,96,73,255
2140 DATA49,170,145,170,96,32,34,194,165,20,141,134,3,165,21,141,135,3,32,34
2150 DATA194,165,20,141,136,3,141,143,3,32,34,194,165,20,141,137,3,32,197,194
2160 DATA76,215,192,169,0,6,252,6,251,101,252,133,252,96,173,143,3,74,74,74
2170 DATA170,169,0,133,253,133,254,224,0,240,16,24,165,253,105,40,133,253,165
2180 DATA254,105,0,133,254,202,208,240,24,165,253,109,139,3,133,253,165,254
2190 DATA105,0,133,254,165,253,24,169,92,101,254,133,254,96,32,34,194,165,20
2200 DATA141,132,3,32,34,194,165,20,141,133,3,96,173,132,3,10,10,10,10,13,133
2210 DATA3,160,0,145,253,96,173,136,3,74,74,74,141,138,3,173,135,3,74,173,134
2220 DATA3,106,74,74,141,139,3,141,139,3,173,136,3,41,7,141,140,3,173,138,3
2230 DATA133,251,169,0,133,252,162,6,32,54,193,202,208,250,165,252,133,171,165
2240 DATA251,133,170,32,54,193,32,54,193,24,165,251,101,170,133,170,165,252
2250 DATA101,171,133,171,169,0,133,252,173,139,3,133,251,32,54,193,32,54,193
2260 DATA32,54,193,24,165,251,101,170,133,170,165,252,101,171,133,171,24,173
2270 DATA140,3,101,170,133,170,169,0,101,171,133,171,24,169,0,101,170,133,170
2280 DATA169,96,101,171,133,171,96,32,253,174,32,138,173,32,247,183,96,32,34
2290 DATA194,165,20,141,144,3,165,21,141,145,3,32,34,194,165,20,141,146,3,32
2300 DATA34,194,165,20,141,137,3,32,34,194,165,20,141,148,3,32,34,194,165,20
2310 DATA141,149,3,32,172,194,78,147,3,78,147,3,78,147,3,173,149,3,208,3,78
2320 DATA147,3,24,173,144,3,109,147,3,141,134,3,173,145,3,105,0,141,135,3,32
2330 DATA172,194,78,147,3,78,147,3,78,147,3,173,149,3,208,3,78,147,3,24,173
2340 DATA146,3,109,147,3,141,136,3,141,143,3,32,197,194,32,215,192,206,148,3
2350 DATA208,174,96,169,255,141,14,212,141,15,212,169,128,141,18,212,169,128
2360 DATA141,24,212,173,27,212,141,147,3,96,173,136,3,201,200,144,5,169,200
2370 DATA141,136,3,173,135,3,240,12,173,134,3,201,64,144,5,169,63,141,134,3
2380 DATA96
2390 REM
2400 FOR I=49152 TO 49890
2410 READ X: T=T+X
2420 POKEI,X:NEXT
2430 IF T<>81876 THEN PRINT"ERROR IN DATA":END
2440 RETURN
```

ARCADIA

Old square eyes Phil South is back with more games and a few high scores.

A MONTH OVER ALREADY? COR blimey, don't time fly when you're 'avin' fun. Still, off we go! In this month's packed column we've got lots of what can only be described as "stuff"; a squint at new games, readers letters, hi-scores and comment, all bound up in the deathless prose you've come to know and love.

Oh yes, wait a minute Mr postman...

Last month I got a letter from David Edwards of Carlisle asking abot M.U.L.E. and Archon (Ariolasoft), as to whether they were any good, well, yes they are.

Archon is a cross between a shoot 'em-up, Dungeons & Dragons and Chess. It is totally triff, but I highly recommend that you play against a Human player, rather than against the computer, because on the Combat screens (the shooty bit) the computer will beat you every time, by virtue of the fact it doesn't have to use a joystick. (Fiendishly clever these computers!)

M.U.L.E. is a strategy game which by rights ought to be very boring. But it isn't! In places, it even manages to be educational! (Streuth!) You are a little bongley looking alien (you even get to choose what colour you are) who is put on a planet to try and grow and sell crops; you are in competition with three opponents. The name of the game is buying, selling and bidding and generally managing funds. (A handy skill, which everyone needs. Just ask my bank manager.) with the help of your friendly robot mule. Terrific fun and a real challenge.

This brings me to a good point. I reckon that arcade games are finally coming of age. Arcade/Strategy involves thinking. If you have to use your head, you won't turn into a brainless moron, whose only expression of a creative act is to blast a pretty coloured sprite into a zillion sparkling pixels. I mean REAL strategy, not the phoney strategy of a game like Raid on Bungeling Bay (Ariolosoft), which impresses the strategic advantage to be gained by blasting everything that moves out of the water (a tactic favoured by US Generals). No, I mean winning a game by skill of the brain, rather than JUST reflexes. Software houses take note!

Sneaky peeks of the last four weeks

From time to time, I get to see new US games. Sooner or later, these little nuggets will find their way into English shops, so here is my first Transatlantic Preview.

One to look ot for is Henry's House. I didn't catch the name of the software house, but look out for it anyway; it's a platform game, with it's roots firmly burrowed into Manic Miner. (There is even a guest appearance by the rolling pin waving chefs!) It's got the most amazing graphics; makes the 64 perform like a souped-up Atari!

Survivor is the most aptly named shoot-'em-up I've ever played. At first it's not apparent what the point is, just spinning around in space in a little round spaceship that fires back and front simultaneously. You score for everything you hit (and there's lots to hit), but the trick is to stay alive. Metorites and bug-eyed monsters are out to get you while you're blasting at lasercannon protected fortresses. Believe me, it's difficult. The ship has inertia, so it's easy to lose control and if you bump into anything at all, Baboom! My best try on this game got me 6080; draw your own conclusions. Watch out for Survivor, it's fantastic!

Faves from the rave

Games I've been playing this month:
Drelbs (Synsoft/US GOLD) a really zippy strategy game
Cavelon II (Jetsoft) a medieval Manic Miner clone HI SCORE 22900
Chuckie Egg (A&F) a sort of Manic Chicken HI SCORE 17480
Toy Bizzare (Activision) yet another platform format 20800
Boulder Dash (First Star) the only Dig game I can bear HI SCORE 13089

I've forsaken CAD CAM Warrior (Taskset) in favour of Boulder Dash as the game I play every day. There is always one favourite game that absorbs me more than all others, and it changes from time to time. This set me to thinking; why don't you write in and tell me why you like it so much! Let's hear from you. This is YOUR page as much as it is mine, so pen me a note, drop me a line, send me a card, fly me a carrier pidgeon...

By far the most surprisingly brilliant thing I've seen lately is The Rocky Horror Show (CRL). It is the most original and absorbing video game I've seen in a very long time. The graphics are first class, the action amusing and highly challenging (watch out for the entrance to the Lab!) but it's the music that really knocks everything into a cocked hat. Watch for my full playtest in a near future issue.

Not wishing to come on like your social secretary or something, but if you never saw the Rocky Horrow Show the first time around, you're in luck. A fantastic new production of the show is currently doing a coiuntry-wide tour. Write to the theatre company HQ at the Threatre Royale, Henley, for details.

Have you got elite, boy!

Elite 64 (Firebird), contrary to what other mags would have you believe, is not finished yet. But very soon (my inside sources say) the best reason for buying a Beeb will be on the 64! Thank goodness for that. I thought I was going to have to trade in for a Beeb, just to play this game. It really is VERY good, I really can't recommend it highly enough; a kind of mega-arcade/strategy all in 3D with great sound. You buy and sell (or shoot) your way to Elite Class in this galaxy of the future. If you've never seen this game, or haven't heard of it, or don't want a copy of your very own, then you must be an ostritch. (Put this magazine down, and get back to the Zoo, at once! Shoo!)

And now, the end is near...

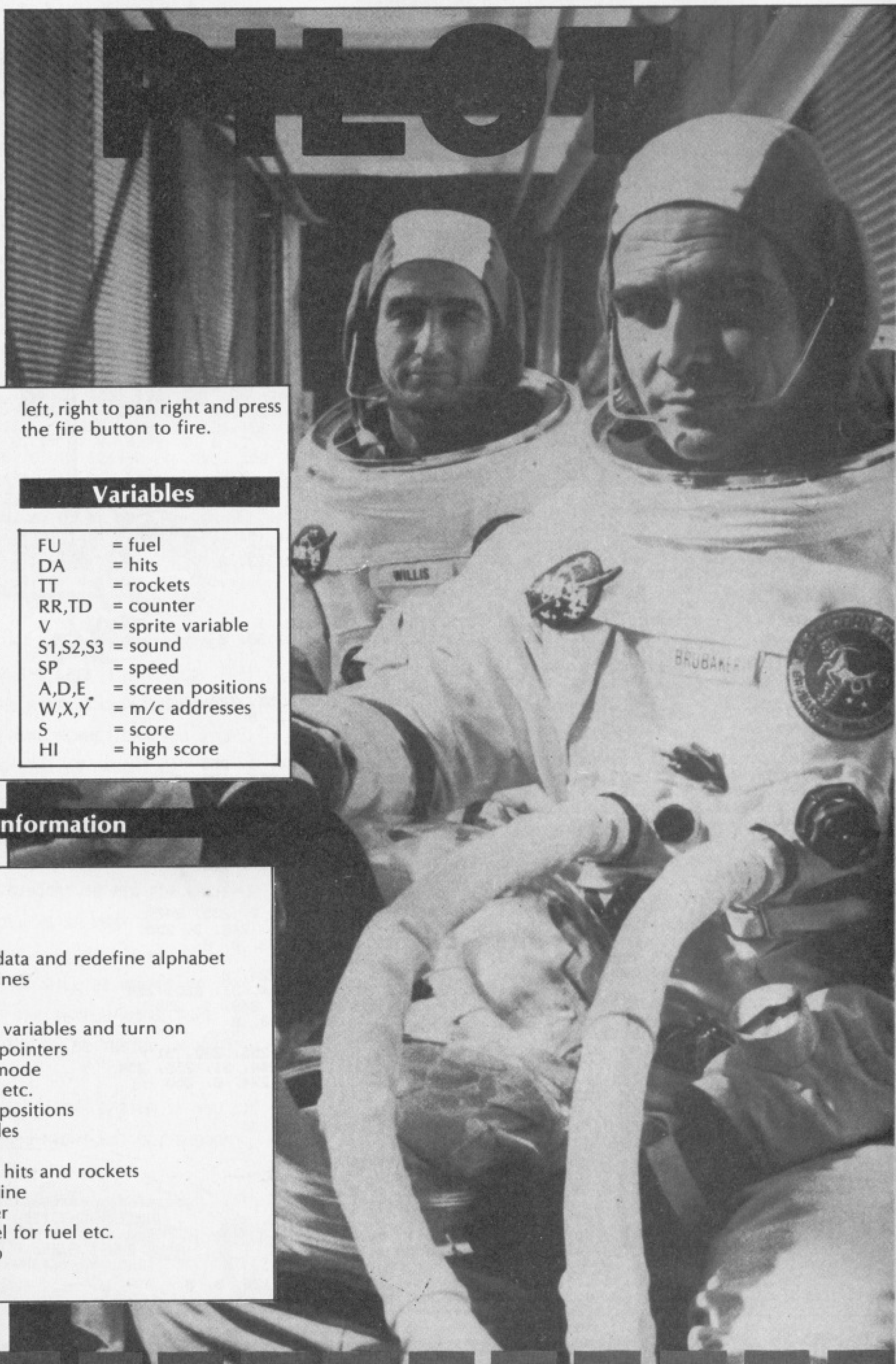
...and so I face the final curtain. That's all of this month's helping of stuff. See you in four weeks, when we will be making a modem out of plastic squeezy bottles, collecting bone buttons out of rashers of bacon and...oh yeah, we might look at a few arcade games and your letters too!

Be seeing you!

SPACE PILOT

Defend yourself and your planet from the marauding hordes of aliens in this space race from Julia Tout.





YOU ARE IN CONTROL OF A marooned space station where you are the last defence before earth. The attacking alien hordes are after your home planet. Can you stop them?

You have a limited amount of rockets and are running out of fuel so you must fill up all your rockets else – caput!

Once you have filled up your hits chamber, you will be warped to another part of the battle.

Press shift/runstop to load the game. With the joystick in port 2, you move it left to pan left, right to pan right and press the fire button to fire.

Variables

FU	= fuel
DA	= hits
TT	= rockets
RR,TD	= counter
V	= sprite variable
S1,S2,S3	= sound
SP	= speed
A,D,E	= screen positions
W,X,Y	= m/c addresses
S	= score
HI	= high score

Program Information

Part 1
Sprite data and instructions

Part 2

0 - 108	Graphics data and redefine alphabet
150 - 1102	M/C routines

Part 3

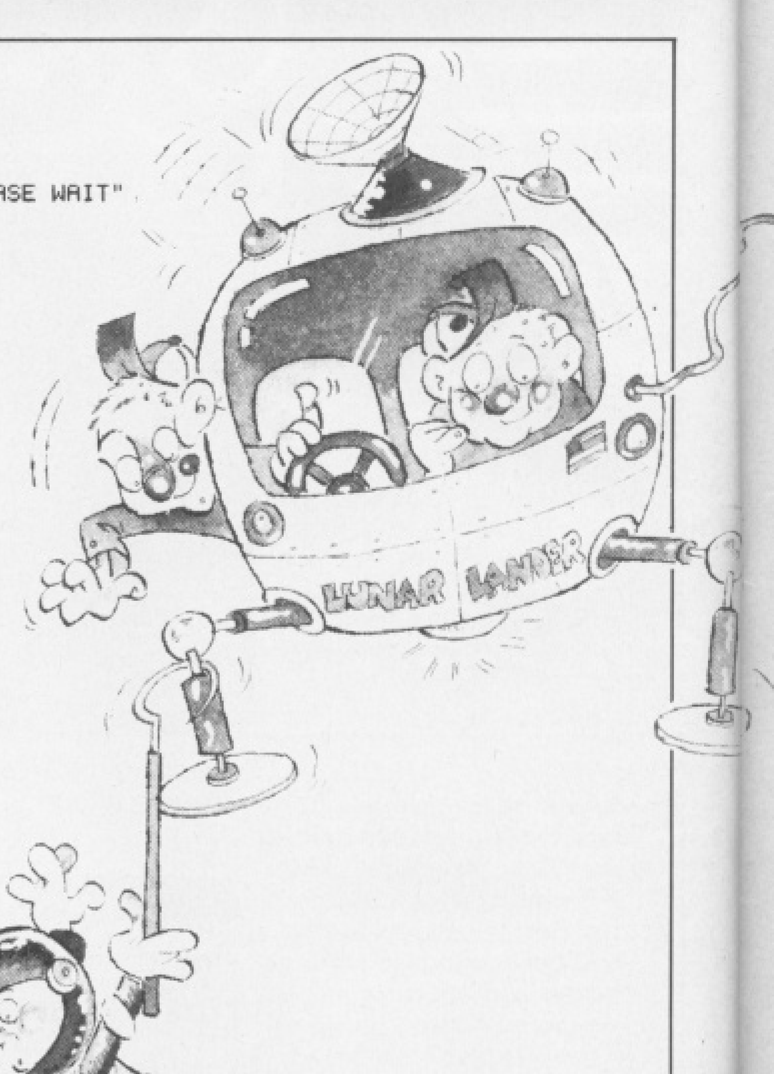
4 - 5	Set sound variables and turn on
6 ---	Set sprite pointers
10 - 20	Set M/C mode
30 - 50	Print stars etc.
60 - 70	Set sprite positions
92 -----	Set variables
99 -----	Call IRQ
100 - 155	Print fuel, hits and rockets
299 - 400	Main routine
500 - 620	Game over
2999 - 3100	Print panel for fuel etc.
5000 - 6010	Print warp
60000 -----	Title page

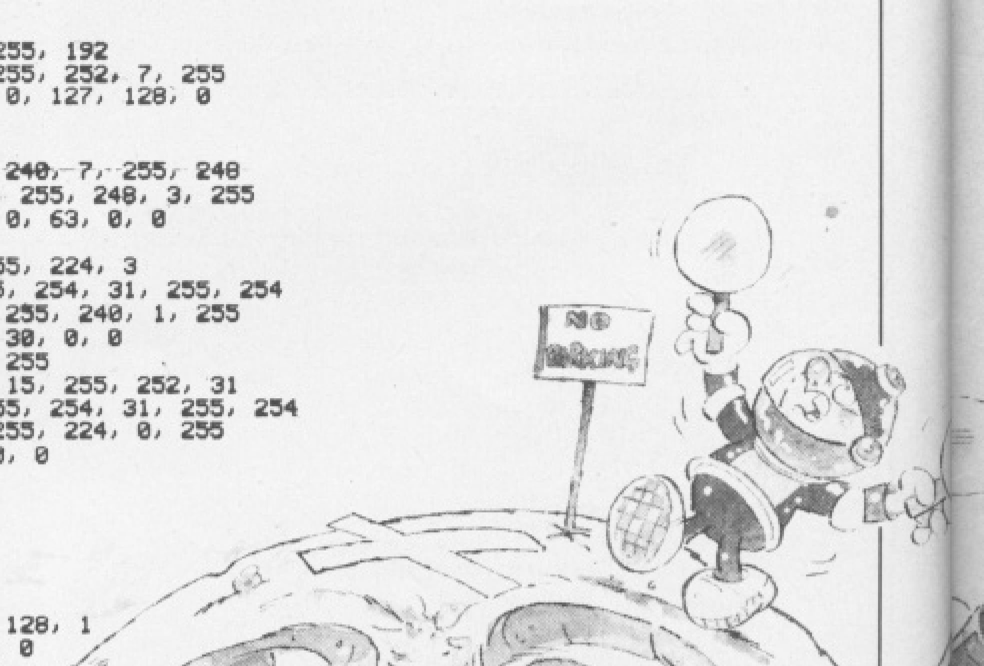
Program Listing 1

```
SPACE PILOT:BY JULIA TOUT:1985:PT 1

0 CLR
1 REM*******SPACE PILOT BY JULIA TOUT 1985*****
2 REM*****SPRITE DATA*****
3 PRINTCHR$(147):POKE53281,0:POKE53280,0:PRINTCHR$(136)TAB(14)"PLEASE WAIT"
4 GOSUB2000
5 W=210*64
10 READA:IFA=-1THEN5000
15 POKEW,A:W=W+1:DA=DA+1:CH=CH+A:GOTO10
20 DATA 0, 8, 0, 0, 8, 0, 0, 8, 0, 0, 8, 0, 0, 8
22 DATA 0, 0, 8, 0, 0, 136, 128, 0, 73, 0, 0, 42, 0, 0
24 DATA 20, 0, 255, 227, 255, 0, 20, 0, 0, 42, 0, 0, 73, 0
26 DATA 0, 136, 128, 0, 8, 0, 0, 8, 0, 0, 8, 0, 0, 8
28 DATA 0, 0, 8, 0, 0, 8, 0, 0, 0, 0, 0, 0, 0, 0
30 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
32 DATA 0, 0, 1, 0, 0, 3, 0, 0, 6, 0, 0, 12, 0, 0
34 DATA 24, 0, 0, 48, 0, 0, 96, 0, 0, 0, 0, 0, 0, 0
36 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
38 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
40 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 64, 0, 0, 96
42 DATA 0, 0, 48, 0, 0, 24, 0, 0, 12, 0, 0, 6, 0, 0
44 DATA 3, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
46 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
48 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
50 DATA 0, 0, 0, 0, 0, 0, 0, 12, 0, 0, 30, 0, 0, 12
52 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
54 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
56 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
58 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 12, 0
60 DATA 0, 30, 0, 0, 63, 0, 0, 30, 0, 0, 12, 0, 0, 0
62 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
64 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
66 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
68 DATA 0, 0, 0, 12, 0, 0, 30, 0, 0, 63, 0, 0, 127, 128
70 DATA 0, 63, 0, 0, 30, 0, 0, 12, 0, 0, 0, 0, 0
72 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
74 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
76 DATA 0, 0, 0, 0, 0, 0, 0, 0, 12, 0, 0, 30, 0, 0
78 DATA 63, 0, 0, 127, 128, 0, 255, 192, 0, 127, 128, 0, 63, 0
80 DATA 0, 30, 0, 0, 12, 0, 0, 0, 0, 0, 0, 0, 0
82 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
84 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 12
86 DATA 0, 0, 30, 0, 0, 63, 0, 0, 127, 128, 0, 255, 192, 1
88 DATA 255, 224, 0, 255, 192, 0, 127, 128, 0, 63, 0, 0, 30, 0
90 DATA 0, 12, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
92 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
94 DATA 0, 0, 0, 0, 12, 0, 0, 30, 0, 0, 63, 0, 0, 127
96 DATA 128, 0, 255, 192, 1, 255, 224, 3, 255, 240, 1, 255, 224, 0
98 DATA 255, 192, 0, 127, 128, 0, 63, 0, 0, 30, 0, 0, 12, 0
100 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
102 DATA 0, 0, 0, 0, 0, 0, 0, 0, 12, 0, 0, 30, 0
104 DATA 0, 63, 0, 0, 127, 128, 0, 255, 192, 1, 255, 224, 3, 255
106 DATA 240, 7, 255, 248, 3, 255, 240, 1, 255, 224, 0, 255, 192, 0
108 DATA 127, 128, 0, 63, 0, 0, 30, 0, 0, 12, 0, 0, 0, 0
110 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

112 DATA 12, 0, 0, 30, 0, 0, 63, 0, 0, 127, 128, 0, 255, 192
114 DATA 1, 255, 224, 3, 255, 240, 7, 255, 248, 15, 255, 252, 7, 255
116 DATA 248, 3, 255, 240, 1, 255, 224, 0, 255, 192, 0, 127, 128, 0
118 DATA 63, 0, 0, 30, 0, 0, 12, 0, 0, 0, 0, 0, 0
120 DATA 0, 0, 0, 0, 0, 12, 0, 0, 30, 0, 0, 63, 0, 0
122 DATA 127, 128, 0, 255, 192, 1, 255, 224, 3, 255, 240, 7, 255, 248
124 DATA 15, 255, 252, 31, 255, 254, 15, 255, 252, 7, 255, 248, 3, 255
126 DATA 240, 1, 255, 224, 0, 255, 192, 0, 127, 128, 0, 63, 0, 0
128 DATA 30, 0, 0, 12, 0, 0, 0, 0, 0, 0, 0, 0, 0, 30
130 DATA 0, 0, 63, 0, 0, 127, 128, 0, 255, 192, 1, 255, 224, 3
132 DATA 255, 240, 7, 255, 248, 15, 255, 252, 31, 255, 254, 31, 255, 254
134 DATA 31, 255, 254, 15, 255, 252, 7, 255, 248, 3, 255, 240, 1, 255
136 DATA 224, 0, 255, 192, 0, 127, 128, 0, 63, 0, 0, 30, 0, 0
138 DATA 0, 0, 0, 0, 0, 0, 0, 63, 0, 0, 127, 128, 0, 255
140 DATA 192, 1, 255, 224, 3, 255, 240, 7, 255, 248, 15, 255, 252, 31
142 DATA 255, 254, 31, 255, 254, 31, 255, 254, 31, 255, 254, 31, 255, 254
144 DATA 15, 255, 252, 7, 255, 248, 3, 255, 240, 1, 255, 224, 0, 255
146 DATA 192, 0, 127, 128, 0, 63, 0, 0, 0, 0, 0, 0, 0, 0
148 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
150 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
152 DATA 60, 0, 0, 60, 0, 0, 60, 0, 0, 0, 0, 0, 0, 0
154 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
156 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
158 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
160 DATA 0, 0, 60, 0, 0, 60, 0, 1, 255, 128, 1, 255, 128, 1
162 DATA 255, 128, 0, 60, 0, 0, 60, 0, 0, 0, 0, 0, 0, 0
164 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
166 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
168 DATA 0, 0, 0, 0, 0, 0, 0, 0, 60, 0, 0, 60, 0, 0, 255
170 DATA 0, 15, 255, 240, 15, 255, 240, 15, 255, 240, 0, 126, 0, 0
172 DATA 60, 0, 0, 60, 0, 0, 0, 0, 0, 0, 0, 0, 0
```





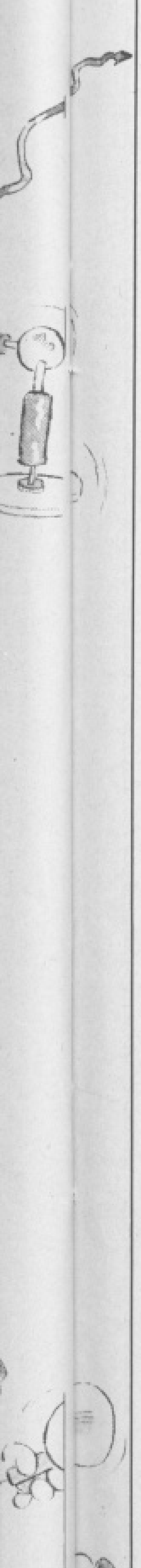
Program Listing 1 (cont.)

```
174 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
176 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 60, 0
178 DATA 0, 60, 0, 0, 126, 0, 1, 255, 128, 63, 255, 252, 63, 255
180 DATA 252, 63, 255, 252, 1, 255, 128, 0, 126, 0, 0, 60, 0, 0
182 DATA 60, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
184 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
186 DATA 0, 0, 0, 60, 0, 0, 60, 0, 0, 126, 0, 0, 255, 0
188 DATA 7, 255, 224, 255, 255, 255, 255, 255, 255, 255, 255, 255, 7, 255
190 DATA 224, 0, 255, 0, 0, 126, 0, 0, 60, 0, 0, 60, 0, 0
192 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
194 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 126, 0, 1
196 DATA 255, 128, 3, 255, 192, 15, 126, 240, 63, 193, 252, 243, 255, 255
198 DATA 243, 255, 255, 243, 255, 255, 63, 255, 252, 15, 255, 240, 3, 255
200 DATA 192, 1, 255, 128, 2, 126, 64, 4, 0, 32, 8, 0, 16, 0
202 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
204 DATA 0, 0, 0, 0, 126, 0, 1, 255, 128, 3, 255, 192, 15
206 DATA 126, 240, 63, 193, 252, 252, 255, 255, 252, 255, 255, 252, 255, 255
208 DATA 63, 255, 252, 15, 255, 240, 3, 255, 192, 1, 255, 128, 2, 126
210 DATA 64, 4, 0, 32, 8, 0, 16, 0, 0, 0, 0, 0, 0
212 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 126
214 DATA 0, 1, 255, 128, 3, 255, 192, 15, 126, 240, 63, 193, 252, 255
216 DATA 63, 255, 255, 63, 255, 255, 63, 255, 63, 255, 252, 15, 255, 240
218 DATA 3, 255, 192, 1, 255, 128, 2, 126, 64, 4, 0, 32, 8, 0
220 DATA 16, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
222 DATA 0, 0, 0, 0, 0, 0, 0, 126, 0, 1, 255, 128, 3, 255
224 DATA 192, 15, 126, 240, 63, 193, 252, 255, 207, 255, 255, 207, 255, 255
226 DATA 207, 255, 63, 255, 252, 15, 255, 240, 3, 255, 192, 1, 255, 128
228 DATA 2, 126, 64, 4, 0, 32, 8, 0, 16, 0, 0, 0, 0, 0
230 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
232 DATA 0, 126, 0, 1, 255, 128, 3, 255, 192, 15, 126, 240, 63, 193
234 DATA 252, 255, 243, 255, 255, 243, 255, 255, 243, 255, 63, 255, 252, 15
236 DATA 255, 240, 3, 255, 192, 1, 255, 128, 2, 126, 64, 4, 0, 32
238 DATA 8, 0, 16, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
240 DATA 0, 0, 0, 0, 0, 0, 0, 0, 126, 0, 1, 255, 128
242 DATA 3, 255, 192, 15, 126, 240, 63, 193, 252, 255, 254, 127, 255, 254
244 DATA 127, 255, 254, 127, 63, 255, 252, 15, 255, 240, 3, 255, 192, 1
246 DATA 255, 128, 2, 126, 64, 4, 0, 32, 8, 0, 16, 0, 0, 0
248 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
250 DATA 0, 0, 0, 126, 0, 1, 255, 128, 3, 255, 192, 15, 126, 240
252 DATA 63, 193, 252, 255, 255, 207, 255, 255, 207, 255, 255, 207, 63, 255
254 DATA 252, 15, 255, 240, 3, 255, 192, 1, 255, 128, 2, 126, 64, 4
256 DATA 0, 32, 8, 0, 16, 0, 0, 0, 0, 0, 0, 255,-1
1999 REM***************************************
2000 POKE53272,22
2000 REM WHT
2001 PRINT"■ IOU ARE IN CONTROL OF A MAROONED SPACE ";
2004 REM CYN
2005 PRINT"◣ STATION,AND ARE THE LAST STRONGHOLD    ";
2009 REM WHT
2010 PRINT"■ BEFORE EARTH.IHE ATTACKING ALIEN HORDES";
2014 REM CYN
2015 PRINT"◣ ARE AFTER YOUR HOME PLANET,CAN YOU STOP";
2019 REM WHT
2020 PRINT"■ THEM. IOU HAVE A LIMITED AMOUNT OF      ";
2024 REM CYN
2025 PRINT"◣ _OCKETS AND ARE RUNNING OUT OF _UEL SO ";
2029 REM WHT RED WHT
2030 PRINT"■  IOU HAVE TO FILL YOU ■⊾I●■ CHAMBER      ";
2034 REM CYN
2035 PRINT"◣ BEFORE YOU RUN OUT OF FUEL OR USE UP   ";
2039 REM WHT
2040 PRINT"■ ALL YOUR _OCKETS.●CORE 50 PTS FOR EACH ";
2044 REM CYN
2045 PRINT"◣ ●HIP YOU ‾ESTROY. ⟋S IN PORT 2.       ";
2049 REM WHT
2050 PRINT"■ LEFT = LEFT _IGHT = RIGHT _/B =FIRE    "
2054 REM CYN
2055 PRINT"◣ ⌐F YOU SUCCEED YOU WILL BE WARPED TO   ";
2059 REM WHT
2060 PRINT"■ ANOTHER PART OF THE BATTLE WHERE YOUR  ";
2064 REM CYN
2065 PRINT"◣ ●PEED AND TALENT WILL BE TESTED ON NEW ";
2069 REM WHT
2070 PRINT"■ FASTER ALIENS.                         "
2074 REM CYN
2075 PRINT"◣ IOU WILL BE ABLE TO FIRE FASTER IF YOU ";
2079 REM WHT
2080 PRINT"■ KEEP STILL BUT YOU MIGHT NOT GET ENOUGH";
2084 REM CYN
2085 PRINT"◣ HITS TO GO THROUGH THE WARP."
3000 RETURN
3010 REM***************************************
5000 IFDA<1665THENPRINT"YTOO LITTLE DATA":END
5005 IFDA>1665THENPRINT"TOO MUCH DATA":END
5010 IFCH<>93974THENPRINT"DATA ERROR;":END
6000 POKE53272,21:POKE198,2:POKE631,13:LOAD

READY.
```







Program Listing 2

```
SPACE PILOT:BY JULIA TOUT:1985:PT 3

 0 CLR
 5 W=12288
 10 READA:IFA=-1THEN150
 15 POKEW,A:W=W+1:DA=DA+1:CH=CH+A:GOTO10
 20 DATA 0, 0, 0, 0, 0, 0, 0, 0, 48, 124, 108, 126, 118, 102
 22 DATA 102, 0, 48, 124, 108, 126, 118, 102, 126, 0, 60, 108, 108, 96
 24 DATA 96, 118, 62, 0, 120, 108, 118, 118, 118, 108, 120, 0, 126, 118
 26 DATA 96, 124, 96, 118, 126, 0, 126, 118, 96, 124, 100, 112, 112, 0
 28 DATA 60, 118, 96, 110, 118, 126, 60, 0, 108, 110, 118, 126, 102, 118
 30 DATA 118, 0, 124, 56, 24, 28, 28, 30, 62, 0, 62, 30, 28, 12
 32 DATA 108, 120, 56, 0, 110, 108, 124, 112, 124, 108, 110, 0, 96, 96
 34 DATA 112, 112, 112, 124, 62, 0, 54, 119, 127, 107, 119, 119, 119, 0
 36 DATA 54, 118, 122, 126, 111, 119, 119, 0, 62, 103, 115, 119, 103, 115
 38 DATA 62, 0, 126, 103, 115, 126, 96, 112, 112, 0, 62, 103, 115, 115
 40 DATA 115, 62, 15, 0, 126, 115, 103, 126, 124, 102, 103, 0, 62, 115
 42 DATA 97, 62, 67, 103, 62, 0, 127, 60, 24, 24, 28, 28, 28, 0
 44 DATA 103, 103, 71, 103, 102, 126, 60, 0, 103, 103, 103, 71, 102, 62
 46 DATA 28, 0, 119, 119, 107, 107, 127, 119, 54, 0, 103, 119, 62, 28
 48 DATA 62, 119, 103, 0, 115, 51, 62, 24, 24, 28, 28, 0, 126, 15
 50 DATA 12, 24, 48, 127, 63, 0, 60, 48, 48, 48, 48, 48, 60, 0
 52 DATA 12, 18, 48, 124, 48, 98, 252, 0, 60, 12, 12, 12, 12, 12
 54 DATA 60, 0, 0, 24, 60, 126, 24, 24, 24, 24, 0, 16, 48, 127
 56 DATA 127, 48, 16, 0, 0, 0, 0, 0, 0, 0, 0, 0, 24, 24
 58 DATA 24, 24, 0, 0, 24, 0, 102, 102, 102, 0, 0, 0, 0, 0
 60 DATA 102, 102, 255, 102, 255, 102, 102, 0, 24, 62, 96, 60, 6, 124
 62 DATA 24, 0, 98, 102, 12, 24, 48, 102, 70, 0, 60, 102, 60, 56
 64 DATA 103, 102, 63, 0, 6, 12, 24, 0, 0, 0, 0, 0, 12, 24
 66 DATA 48, 48, 48, 24, 12, 0, 48, 24, 12, 12, 12, 24, 48, 0
 68 DATA 0, 102, 60, 255, 60, 102, 0, 0, 0, 24, 24, 126, 24, 24
 70 DATA 0, 0, 0, 0, 0, 0, 0, 24, 24, 48, 0, 0, 0, 126
 72 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 24, 24, 0, 0, 3
 74 DATA 6, 12, 24, 48, 96, 0, 60, 102, 110, 118, 102, 102, 60, 0
 76 DATA 24, 24, 56, 24, 24, 24, 126, 0, 60, 102, 6, 12, 48, 96
 78 DATA 126, 0, 60, 102, 6, 28, 6, 102, 60, 0, 6, 14, 30, 102
 80 DATA 127, 6, 6, 0, 126, 96, 124, 6, 6, 102, 60, 0, 60, 102
 82 DATA 96, 124, 102, 102, 60, 0, 126, 102, 12, 24, 24, 24, 24, 0
 84 DATA 60, 102, 102, 60, 102, 102, 60, 0, 60, 102, 102, 62, 6, 102
 86 DATA 60, 0, 0, 0, 24, 0, 0, 24, 0, 0, 0, 0, 24, 0
 88 DATA 0, 24, 24, 48, 14, 24, 48, 96, 48, 24, 14, 0, 0, 0
 90 DATA 126, 0, 126, 0, 0, 0, 112, 24, 12, 6, 12, 24, 112, 0
 92 DATA 60, 102, 6, 12, 24, 0, 24, 0, 0, 255, 0, 0, 0, 0
 94 DATA 0, 0, 85, 85, 85, 89, 89, 85, 85, 85, 85, 85, 85, 85
 96 DATA 85, 85, 85, 85, 255, 255, 255, 255, 255, 255, 255, 255, 170, 170
 98 DATA 170, 170, 170, 170, 170, 170, 128, 128, 128, 128, 128, 128, 128, 128
 100 DATA 192, 192, 192, 192, 192, 192, 192, 192, 224, 224, 224, 224, 224, 224
 102 DATA 224, 224, 240, 240, 240, 240, 240, 240, 240, 240, 248, 248, 248, 248
 104 DATA 248, 248, 248, 248, 252, 252, 252, 252, 252, 252, 252, 252, 254, 254
 106 DATA 254, 254, 254, 254, 254, 254, 255, 255, 255, 255, 255, 255, 255, 255
 108 DATA 0, 255, 0, 255, 0, 255, 0, 11, 0, 255, 0, 32, 0, 37,-1
 150 W=49152
 160 READA:IFA=-1THEN1000
 170 POKEW,A:W=W+1:DA=DA+1:CH=CH+A:GOTO160
 200 DATA 173, 0, 220, 201, 123, 208, 4, 32, 78, 192, 96, 201, 107, 208
 202 DATA 9, 32, 78, 192, 169, 1, 141, 255, 3, 96, 201, 119, 208, 4
 204 DATA 32, 99, 192, 96, 201, 103, 208, 11, 32, 99, 192, 169, 1, 141
 206 DATA 255, 3, 96, 201, 111, 201, 111, 208, 6, 169, 1, 141, 255, 3
 208 DATA 96, 169, 0, 141, 87, 0, 141, 255, 3, 96, 234, 234, 234, 234
 210 DATA 234, 234, 234, 234, 234, 234, 234, 234, 169, 1, 141, 87, 0, 32
 212 DATA 48, 193, 32, 183, 192, 32, 37, 194, 234, 234, 234, 234, 234, 234
 214 DATA 96, 169, 1, 141, 87, 0, 32, 248, 192, 32, 183, 192, 32, 62
 216 DATA 194, 234, 234, 234, 234, 234, 234, 96, 173, 255, 3, 201, 1, 208
 218 DATA 32, 173, 3, 208, 201, 90, 240, 25, 238, 3, 208, 206, 2, 208
 220 DATA 238, 3, 208, 206, 2, 208, 206, 4, 208, 206, 4, 208, 206, 5
 222 DATA 208, 206, 5, 208, 96, 169, 155, 141, 3, 208, 141, 5, 208, 169
 224 DATA 90, 141, 2, 208, 169, 220, 141, 4, 208, 169, 0, 141, 255, 3
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Program Listing 2 (cont.)

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226 DATA 96, 169, 0, 141, 18, 212, 169, 10, 141, 17, 212, 169, 8, 141
228 DATA 19, 212, 173, 18, 208, 141, 15, 212, 169, 65, 141, 18, 212, 96
230 DATA 111, 0, 255, 0, 255, 0, 255, 0, 255, 20, 255, 0, 110, 0
232 DATA 255, 0, 0, 0, 219, 0, 255, 144, 255, 0, 255, 0, 255, 0
234 DATA 46, 139, 255, 0, 255, 0, 255, 0, 255, 0, 169, 40, 133, 251
236 DATA 169, 4, 133, 252, 169, 0, 133, 254, 160, 0, 177, 251, 133, 253
238 DATA 160, 1, 177, 251, 136, 145, 251, 200, 200, 192, 40, 208, 245, 160
240 DATA 39, 165, 253, 145, 251, 165, 251, 105, 39, 133, 251, 144, 2, 230
242 DATA 252, 230, 254, 166, 254, 224, 14, 208, 213, 96, 169, 40, 133, 251
244 DATA 169, 4, 133, 252, 169, 0, 133, 254, 160, 39, 177, 251, 133, 253
246 DATA 160, 38, 177, 251, 200, 145, 251, 136, 136, 192, 255, 208, 245, 160
248 DATA 0, 165, 253, 145, 251, 165, 251, 105, 39, 133, 251, 144, 2, 230
250 DATA 252, 230, 254, 166, 254, 224, 14, 208, 213, 96, 173, 255, 3, 201
252 DATA 1, 208, 21, 169, 0, 141, 11, 212, 169, 10, 141, 12, 212, 173
254 DATA 3, 208, 141, 8, 212, 169, 33, 17, 11, 212, 96, 173, 255, 3
256 DATA 201, 1, 208, 5, 169, 1, 141, 251, 0, 96, 173, 251, 0, 201
258 DATA 1, 208, 58, 173, 3, 208, 201, 90, 240, 25, 206, 3, 208, 238
260 DATA 2, 208, 206, 3, 208, 238, 2, 208, 206, 4, 208, 206, 4, 208
262 DATA 206, 5, 208, 206, 5, 208, 96, 169, 156, 141, 3, 208, 141, 5
264 DATA 208, 169, 110, 141, 2, 208, 169, 240, 141, 4, 208, 169, 0, 141
266 DATA 255, 3, 141, 251, 0, 96, 238, 35, 208, 96, 173, 252, 0, 201
268 DATA 1, 240, 20, 173, 6, 208, 201, 254, 240, 7, 238, 6, 208, 32
270 DATA 15, 194, 96, 169, 1, 141, 252, 0, 96, 173, 252, 0, 201, 0
272 DATA 240, 20, 173, 6, 208, 201, 0, 240, 7, 206, 6, 208, 32, 15
274 DATA 194, 96, 169, 0, 141, 252, 0, 96, 96, 173, 251, 7, 201, 228
276 DATA 240, 4, 238, 251, 7, 96, 169, 1, 141, 252, 3, 169, 224, 141
278 DATA 251, 7, 96, 238, 8, 208, 238, 8, 208, 238, 10, 208, 238, 10
280 DATA 208, 238, 12, 208, 238, 12, 208, 238, 14, 208, 238, 14, 208, 96
282 DATA 206, 8, 208, 206, 8, 208, 206, 10, 208, 206, 10, 208, 206, 12
284 DATA 208, 206, 12, 208, 206, 14, 208, 206, 14, 208, 96, 162, 8, 189
286 DATA 1, 208, 24, 105, 1, 157, 1, 208, 201, 160, 144, 6, 173, 4
288 DATA 220, 157, 0, 208, 232, 232, 224, 16, 208, 231, 96, 162, 4, 189
290 DATA 248, 7, 24, 105, 1, 201, 224, 144, 2, 169, 213, 157, 248, 7
292 DATA 232, 224, 8, 208, 236, 96, 173, 30, 208, 201, 135, 208, 6, 169
294 DATA 1, 141, 255, 0, 96, 201, 39, 208, 6, 169, 2, 141, 255, 0
296 DATA 96, 201, 71, 208, 6, 169, 3, 141, 255, 0, 96, 201, 15, 208
298 DATA 6, 169, 4, 141, 255, 0, 96, 201, 23, 208, 6, 169, 5, 141
300 DATA 255, 0, 96, 234, 234, 234, 234, 234, 96, 173, 255, 0, 201, 1
302 DATA 208, 11, 169, 0, 141, 15, 208, 32, 12, 195, 169, 0, 96, 201
304 DATA 2, 208, 9, 169, 0, 141, 11, 208, 32, 12, 195, 96, 201, 3
306 DATA 208, 9, 169, 0, 141, 13, 208, 32, 12, 195, 96, 201, 4, 208
308 DATA 9, 169, 0, 141, 6, 208, 32, 12, 195, 96, 201, 5, 208, 9
310 DATA 169, 0, 141, 9, 208, 32, 12, 195, 96, 96, 169, 0, 141, 4
312 DATA 212, 169, 47, 141, 5, 212, 169, 3, 141, 1, 212, 169, 129, 141
314 DATA 4, 212, 96, 173, 34, 208, 201, 241, 240, 4, 238, 34, 208, 96
316 DATA 169, 0, 141, 34, 208, 96, 173, 35, 208, 201, 241, 240, 4, 238
318 DATA 35, 208, 96, 169, 0, 141, 35, 208, 96, 32, 33, 195, 32, 50
320 DATA 195, 96, 0, 255, 0, 255, 0, 255, 32, 0, 192, 32, 133, 193
322 DATA 32, 104, 193, 32, 146, 193, 32, 212, 193, 32, 183, 192, 32, 216
324 DATA 193, 32, 87, 194, 32, 138, 194, 32, 197, 194, 76, 49, 234, 255
326 DATA 0, 255, 0, 255, 0, 255, 144, 255, 219, 0, 0, 223, 255, 0
328 DATA 0, 239, 0, 75, 0, 0, 16, 0, 127, 0, 255, 0, 255, 0
330 DATA 255, 0, 255, 0, 255, 0, 255, 0, 255, 0, 255, 219, 0, 36
332 DATA 255, 0, 255, 0, 32, 0, 255, 0, 0, 16, 235, 148, 107, 251
334 DATA 13, 47, 144, 255, 91, 223, 255, 32, 223, 0, 173, 32, 208, 201
336 DATA 241, 240, 4, 238, 32, 208, 96, 169, 0, 141, 32, 208, 96, 0,-1
1000 W=51000
1010 READA:IFA=-1THEN5000
1020 POKEW,A:W=W+1:DA=DA+1:CH=CH+A:GOTO1010
1100 DATA 169, 80, 141, 20, 3, 169, 195, 141, 21, 3, 96, 169, 49, 141
1102 DATA 20, 3, 169, 234, 141, 21, 3, 96, 0, -1
5000 IFDA<1619THENPRINT"TOO LITTLE DATA":END
5005 IFDA>1619THENPRINT"TOO MUCH DATA":END
5010 IFCH<>177159THENPRINT"DATA ERROR":END
6000 POKE198,2:POKE631,13:LOAD

READY.
```

Program Listing 3

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SPACE PILOT:BY JULIA TOUT:1985:PT 3

0 POKE808,239
4 FORT=54272TO54276:POKET,0:NEXT:B=49335:SP=25
5 S1=54276:S2=54277:S3=54273:POKE54296,47:POKE54295,245:V=53248
6 FORT=2044TO2047:POKET,229:NEXT:POKE2043,224
10 POKE53270,PEEK(53270)OR16:POKE53272,29:GOTO60000
20 POKE53282,0:POKE53283,1:POKE53280,2:POKE53281,2:B=49335:V=53248
30 A$="||||||||||||||||||||||||||||||||||||||||":PRINTCHR$(147);
40 FORT=0TO13:PRINTA$;:NEXT
50 FORI=0TO100:POKE1024+RND(1)*540,65:SYSB:SYSB:NEXT:POKE49357,65
60 V=53248:POKEV+21,255:POKEV,175:POKEV+1,90:POKE2040,210:POKEV+39,6:GOSUB1005
65 POKEV+2,110:POKEV+3,156:POKEV+4,240:POKEV+5,156:POKEV+27,255
67 POKE2041,211:POKE2042,212:POKEV+40,2:POKEV+41,2:POKEV+27,6
70 POKEV+6,0:POKEV+7,90:POKEV+9,0:POKEV+11,50:POKEV+13,200:POKEV+15,240
92 GOSUB3000:POKE56325,SP:A=1675:D=1755:CO=54272:FU=69:DA=69:TT=69:E=1835
97 REM HOM-WHT
98 PRINT"■■        SCORE              HI-SC          "
99 CA=53282:SYS51000:GOTO200
100 RR=RR+1:IFRR>7THENRR=0:FU=FU+1
105 IFFU>76THENFU=69:A=A+1
110 POKEA,FU:POKEA+CO,0:IFA>1700THENSYS51011:GOTO500
111 RETURN
120 DA=DA+1:IFDA>76THENDA=69:D=D+1
125 SYS49335
130 POKED,DA:POKED+CO,0:IFD>1780THENGOTO5000
131 RETURN
140 TD=TD+1:IFTD>7THENTT=TT+1:TD=0
145 IFTT>76THENTT=69:E=E+1
150 POKEE,TT:POKEE+CO,0:IFE>1860THENSYS51011:GOTO500
155 RETURN
200 Z=49779
299 REM HOM-BLK
300 GOSUB100:SYSZ:IFPEEK(255)>0THENS=S+50:GOSUB120:POKE255,0:PRINT"■■"TAB(15)S
309 REM HOM-BLK
310 IFS>HITHENHI=S:PRINT"■■"TAB(30)HI
350 IFPEEK(251)=1THENGOSUB140
400 GOTO300
500 POKES1,128:POKES2,47:POKES3,5:POKES1,129
501 FORT=0TO50:R=RND(1)*20:FORTT=0TOR
502 POKE53282,R:CC=0:NEXTTT,T
600 B$="GAME  OVER":POKE56325,12:Q=49335:U=646:POKE53281,0:POKE53280,0:SYS51000
604 REM HOM
605 FORT=0TO15:PRINT"■":FORTT=0TO10:PRINTTAB(15)B$:POKEU,RND(1)*7
610 SYSQ:NEXTTT,T
620 POKE56325,25:SP=25:SYS51011:GOTO60000
1000 POKES1,0:POKES1-1,10:POKES2,4:POKES3,RND(1)*255:POKES1,65:RETURN
1005 POKES1,0:POKES2,15:POKES1-1,31:FORT=200TO0STEP-2:POKES3,T:POKES1,33
1006 POKEV+39,T:NEXT:POKEV+39,1:RETURN
2999 REM HOM- 14*CRD-RED
3000 PRINT"■■■■■■■■■■■■■■■■■──────────────────────────────────────";
3009 REM RED YEL WHT RED
3010 PRINT"■─■───────■────────────────────────■─";
3064 REM RED YEL BLK YEL WHT RED YEL RED
3065 PRINT"■─■─■FUEL■─■■───────────────────■■─";
3069 REM RED YEL WHT RED
3070 PRINT"■─■───────■────────────────────────■─";
3074 REM RED YEL BLK YEL WHT RED YEL RED
3075 PRINT"■─■─■HITS■─■■───────────────────■■─";
3079 REM RED YEL WHT RED
3080 PRINT"■─■───────■────────────────────────■─";
3084 REM RED YEL BLK YEL WHT RED YEL RED
3085 PRINT"■─■─■ROCKET■─■■─────────────────■■─";
3089 REM RED YEL WHT RED
3090 PRINT"■─■───────■────────────────────────■─";
3091 REM RED YEL WHT RED
3092 PRINT"■─■───────■────────────────────────■─";
```

Program Listing 3 (cont.)

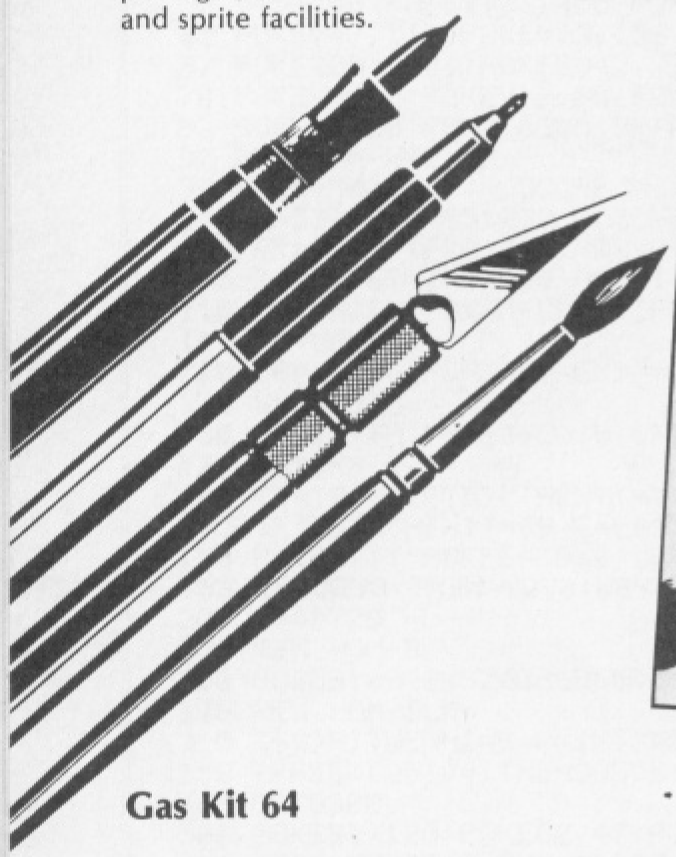
```
3093 PRINT"────────────────────────────────────────
3098 REM HOM
3099 PRINT"■":POKEV+27,255
3100 RETURN
4999 REM CLR-LRD-CRD
5000 POKE53282,1:POKE53283,2:PRINT"■■■":POKE53269,0:POKE56325,15:POKE49537,17
5005 POKE53280,0:POKE53281,0
5008 PRINT"────────────────────────────────────────";
5010 PRINT"‾|||||||||||||||||||||||||||||||||||||‾";
5012 PRINT"‾|───────────────────────────────────|‾";
5014 PRINT"‾|‾|||||||||||||||||||||||||||||||||‾|‾";
5016 PRINT"‾|‾|───────────────────────────────|‾|‾";
5018 PRINT"‾|‾|‾|||||||||||||||||||||||||||||‾|‾|‾";
5020 PRINT"‾|‾|‾|───────────────────────────|‾|‾|‾";
5025 PRINT"‾|‾|‾|‾|||||||||||||||||||||||||‾|‾|‾|‾";
5030 PRINT"‾|‾|‾|‾|                        |‾|‾|‾|‾";
5035 PRINT"‾|‾|‾|‾|                        |‾|‾|‾|‾";
5045 PRINT"‾|‾|‾|‾|                        |‾|‾|‾|‾";
5050 PRINT"‾|‾|‾|‾|                        |‾|‾|‾|‾";
5055 PRINT"‾|‾|‾|‾|                        |‾|‾|‾|‾";
5060 PRINT"‾|‾|‾|‾|                        |‾|‾|‾|‾";
5065 PRINT"‾|‾|‾|‾|||||||||||||||||||||||||‾|‾|‾|‾";
5070 PRINT"‾|‾|‾|───────────────────────────|‾|‾|‾";
5075 PRINT"‾|‾|‾|||||||||||||||||||||||||||||‾|‾|‾";
5080 PRINT"‾|‾|───────────────────────────────|‾|‾";
5085 PRINT"‾|‾|||||||||||||||||||||||||||||||||‾|‾";
5090 PRINT"‾|───────────────────────────────────|‾";
5095 PRINT"‾|||||||||||||||||||||||||||||||||||||‾";
5100 PRINT"────────────────────────────────────────"
5999 W=49987:X=50100:Y=49335:SYS51000
6000 FORT=0TO600:SYSW:NEXT:POKE56325,18:FORT=0TO450:SYSX:SYSW:SYSY:NEXT:SYS51011
6005 S=S+1000+2000-FU:SP=SP-2:POKE53281,0:POKE53280,0
6010 POKE49788,224:POKE49792,213:GOTO20
60000 POKE53282,7:POKE53283,9:POKE53281,11:POKE53280,11:POKEV+21,0
60010 POKE49788,236:POKE49792,229
60014 REM CLR-ORN-  3*CRD
60015 PRINT"■■■■||||||  ||||||  ||||||  |||||  |||||
60020 PRINT"||─────  ||──|‾ ||──|‾ ||───  ||───
60025 PRINT"||‾─────||‾──|‾||‾──|‾||‾────||‾───
60030 PRINT"||||||  |||||‾|||||‾||‾    ||||
60035 PRINT" ────|‾ ||─────||──|‾||‾    ||───
60040 PRINT"  ───|‾||‾─────||‾──|‾||‾    ||‾───
60045 PRINT"||||||‾||‾      ||‾ |‾||||  |||||
60050 PRINT" ───────_ ──_      ──_ ‾_ ─────  ─────
60055 PRINT"  ───────  ──      ──  -  ─────  ─────
60059 REM CRD
60060 PRINT"■||||||   ||||||  ||     |||||  |||||
60065 PRINT"||───|‾   ‾||──── ||‾     |────|‾  ‾|───
60070 PRINT"||‾──|‾    ||‾────||‾     |‾───|‾   |‾────
60075 PRINT"|||||‾     ||‾    ||‾     |‾  |‾    |‾
60080 PRINT"||─────    ||‾    ||‾     |‾  |‾    |‾
60085 PRINT"||‾────    ||‾    ||‾     |‾  |‾    |‾
60090 PRINT"||‾     ||||||  ||||||  ||||‾    |‾
60095 PRINT" ──      ──────  ──────  ──────_   ‾_
60100 PRINT"  ──      ──────  ──────  ─────     -
60101 REM CRD BLK ORN
60102 PRINT"■  ■ BY JULIA TOUT:1985:SPACE TO PLAY.■
60102 REM HOM-CRD YEL ORN
60103 PRINT"■■"TAB(16)"■HIGH SCORE";HI:PRINT"■"
60104 B=49335:POKE49357,17
60110 GETA$:SYSB:SYSB: IFA$=""THEN60110
60120 IFA$=" "THENPOKE49357,37:FORT=0TO1000:SYSB:NEXT:POKE49357,129:S=0:GOTO20
60200 GOTO60110
61000 GOTO61000

READY.
```

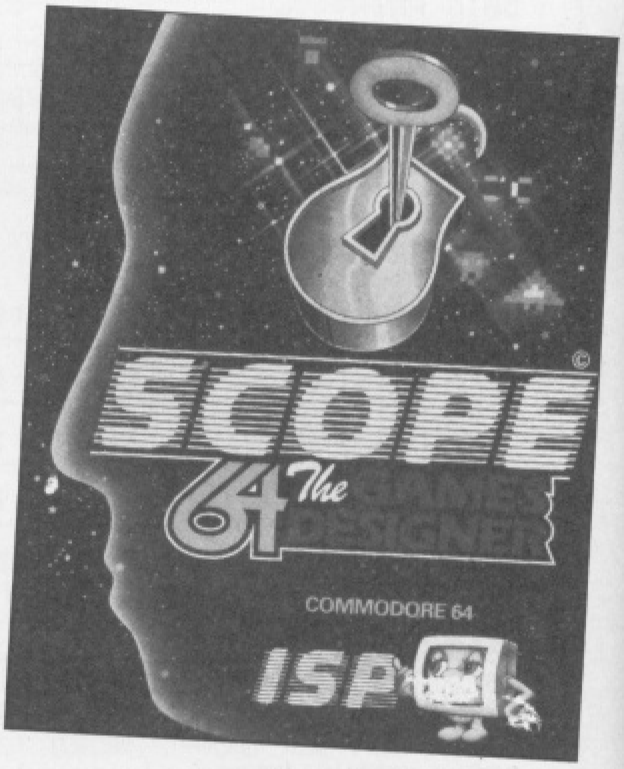
GRAPHICS SOFTWARE

Brendin Lewis takes a discerning look at some graphics packages that are available.

THERE ARE A GREAT NUMBER OF graphics packages available for the C64, maybe this is a reflection on the difficulty of accessing the graphics capabilities directly. Four such packages are covered here, some good, some not so good. These are not all simply graphics packages, some offer sound, animation and sprite facilities.







Gas Kit 64

Gas Kit 64 from Anirog is a general purpose utility package which offers graphics, animation and sound. Control of the various aspects of the package can be controlled either interactively or via program control. Again, the software relies upon the keyboard for almost all command input, rather than by the use of onscreen menu selection by the joystick. The only difference here is that to draw lines, the key must be held down as well as moving the joystick. User friendliness does not come high on the list of priorities with this one.

Artkit is the graphics section of the package, though it offers virtually none of the facilities one would expect from a graphics package. Basically you can draw lines with a pencil (small cursor) or a brush (big cursor). Limited line drawing is also available, though it does not offer fill, copy, zoom, mirror, move, or any shapes except circle. As mentioned, there are only two brush sizes. The manual states that you can draw any picture you like. The thing is, you're going to have to be very patient, as it will take quite a while. It is also possible to define sprites with Artkit, but that bit really isn't worth mentioning.

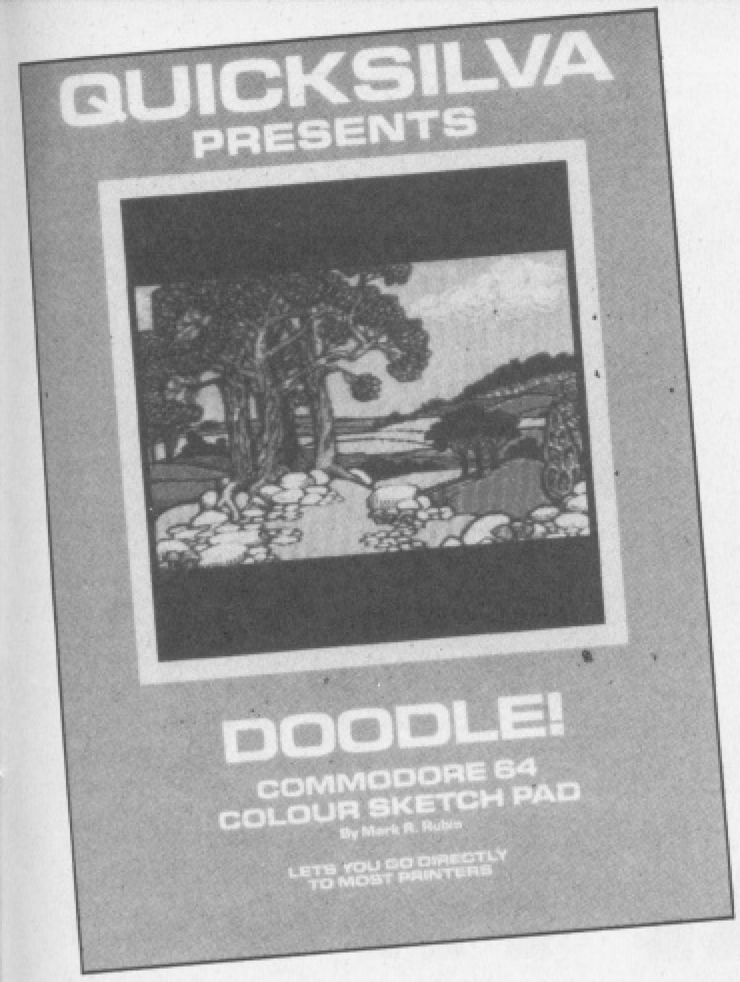
The next section is called Composer, this section from its name obviously deals with sound. From the demo which can be run from the main menu, quite good sound effects are possible. Because you expect to play music with your hands, this package is far easier to use than its brother. You actually have to play the tune you want with the normal keys, which are shown on the screen in piano format. You can choose one or two out of ten instrument sounds at various pitches. When you've decided what you want to play and gone through the above steps, you can play the whole thing back. The tune can be played slower, the same, faster, or much faster than the original way it was played by you.

If and when you are finally satisfied with your masterpiece, various methods of storage and manipulation are available to you. You can store your ditty in what's called replay memory, fetch from replay memory, append to the tune in replay memory and load or save with the disc.

As well as using the utilities interactively, as mentioned, they can also be used from within BASIC programs by means of commands. In all there are 26 BASIC extension commands which allow you to do everything mentioned above. In this form, even the graphics section can be made use of, though the sound sections are pretty good anyway.

Scope

Unlike the other packages, this one is subtitled 'games designer'. When loaded, it moves itself up into high memory. It is from here that its routines are called by BASIC via embedded commands in REM statements. There are 46 new commands in all, which deal with colour, sound, music and graphics. Scope can only handle integer numbers, most of which are single byte values (0 to 255) but it is possible to use double byte words thus extending the range to 0 to 65535. Scope is actually a compiler, all words are compiled into machine code, and once compiled Scope need no longer remain in memory. The use of Scope itself does rely on a working knowledge of BASIC.





As mentioned, Scope adds 46 BASIC extension commands, what follows is a brief explanation of some of the more useful commands. SCR allows scrolling of the screen in all four directions. SPRTS allows set up of the number and colour of sprites. HWAVE sets up a waveform. MUSIC instructs the sound generator to play a tune. The manual covers all the commands in detail. It also gives many example programs for the user to access the compiler commands.

As well as the Scope compiler, the cassette also contains a number of demo programs. These are loaded from the tape then compiled and run. Both the compile and run commands are actually SYS calls. The demos themselves do quite a good job of showing the facilities of Scope. What they do not is show that the package lives up to its boast of games designer.

As ever, the package contains a number of demo screens and these were of a similar standard to the rest of the package. It seems that very little effort has been put into this, though nearly all the usual facilities are available, they are all of such low standard. I very rarely criticise software in this manner, but the best thing about this system was the goodbye option on the menu; even then, it had the cheek to ask me if I was sure I wanted to leave the program!

Doodle

This is another package heavily reliant on the keyboard, even though it is designed for use with a joystick or trackerball. Unlike some of its rivals it also does not use icons and windows for menu selection. This seems a shame because, even though icon is one of the latest buzzwords, they do actually make things much easier to use in most cases, and most definitely with this type of package.

This is actually the third package I've looked at and so far the various methods of drawing lines etc have all been different. This is probably the most difficult to get used to. Actually, it seems that even with practice, mistakes will still be made, particularly when line drawing. On the other hand, the fill is excellent if you don't use the small brush sizes. If you do, the fill colour leaks out and fills the whole screen.

One of the main drawbacks for me when testing this product was that I didn't have a trackerball available. If I had done then I wouldn't have had to rely on the joystick for cursor positioning. Drawing straight vertical and horizontal lines is great but anything else becomes very time consuming as you need to make the pen speed very slow. The one advantage of using the joystick is that you don't get line breakup when in sketch mode as you do with the mouse and the touchpad (see other graphics feature).

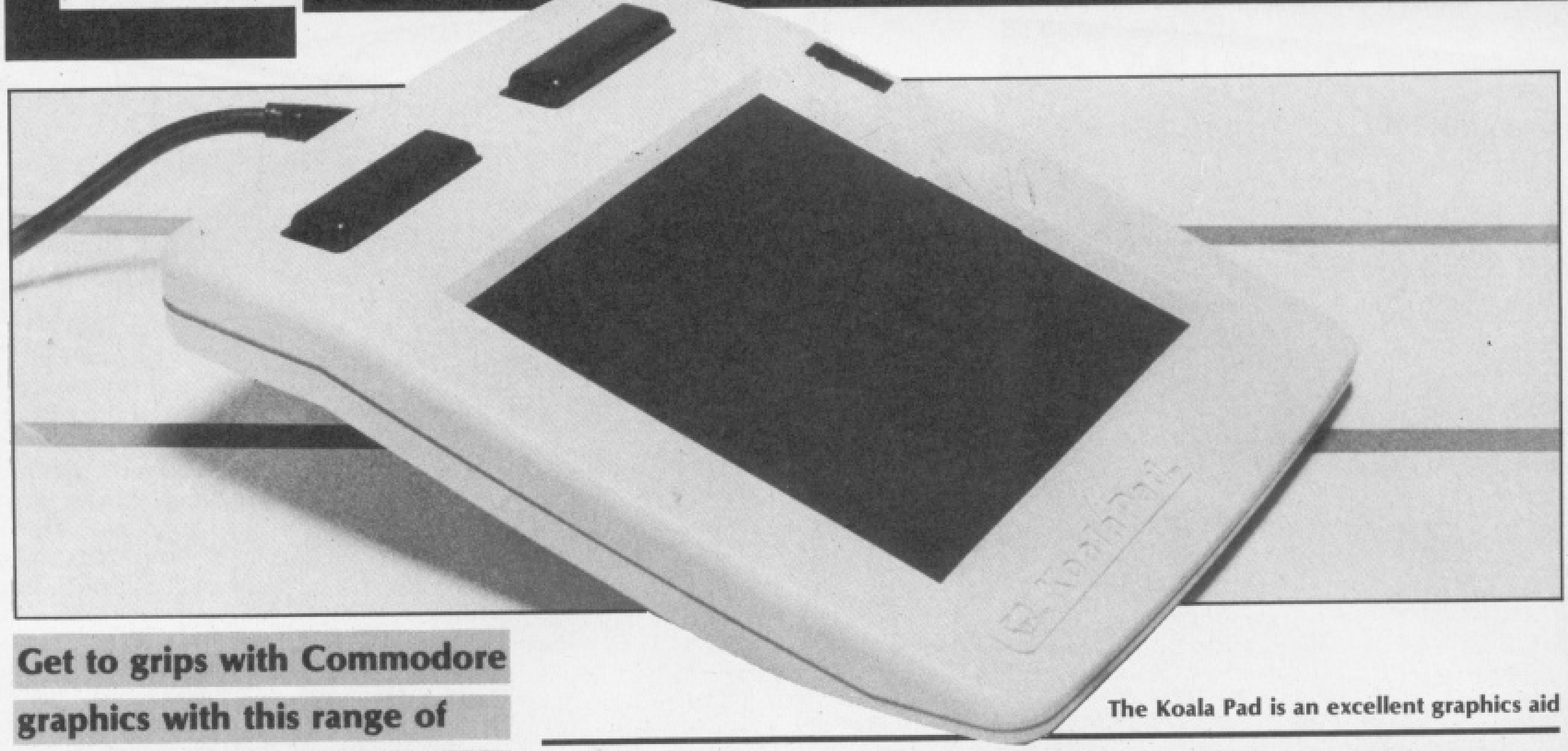
As with the previous packages, this one contains a disc and printer input/output section allowing the user to load and save pictures (or doodles as Quicksilva call them) and also dump screens to a printer. The demo screens were of a high quality, I congratulate the person who actually drew them, it must have taken some time; assuming of course that Doodle was used to draw them.

Activity centre

Of all the packages reviewed, this was the first that offered more than simply graphics and/or sprite editing. This offers a music option whereby the user can design their own tunes. Also, the files here are called pages rather than screens, implying that some form of text processing can also be done. As a bonus, it is also possible to produce animation. I was a little dubious when I read this part but read on and all will be revealed.

Activity centre is a misnomer, it should really be called Inactivity Centre. Everything is so slow, whether it be line, circle or fill. When I say fill, don't be misled, this version of fill simply allows you to define a rectangle to be filled, filling any complicated shape could and probably would take all day.

The only similarity I've found with some of the other packages is that you rely on the keyboard for most of the command input. It does theoretically offer additional features, these being animation and music. Animation allows you to define two shapes that will alternate while moving. The music section is probably the best of the three, and this isn't wonderful by any means. It allows you to define notes from the musical scale, vary their length and let them be sharp or flat. Once you've done this, the tune can be played and modified. Various pre-defined instrument sounds are available to increase the scope of what really is a limited utility.



The Koala Pad is an excellent graphics aid

GRAPHICS HARDWARE

Get to grips with Commodore graphics with this range of hardware reviewed by Brendin Lewis.

WITH THE WIDE SPREAD USE OF microcomputers with high resolution graphics, it seems reasonable for a number of companies to produce hardware to make things a little easier to use. This article covers four such items of hardware: two lightpens, a touchpad, and an electronic mouse. All these hardware packages contain some form of software so this is covered also.

Magic mouse

Though not the first mouse I've used, this is the first that I've encountered for the C64. The immediate impression one gets when the mouse is unpacked is that it's more of a rat than a mouse. The size of the Magic mouse is rather larger than that of the Apple Macintosh or the one supplied by Microsoft.

Other than its size, the mouse is well constructed. The electronic mouse got its name because of its shape and the fact that the cable came from the back like a tail. Using this analogy, this poor beast has a tail growing out of its ear. Sarcastic remarks aside, the mouse fits quite comfortably in the hand and has three coloured control buttons on the front. Underneath is the ball and ball housing, the ball bearing in this case has got a plastic coating. I can see no advantage in this as it just seems to gather more dirt than the normal type. The other thing that is different to the norm are the two positioning screws. These are used to ensure correct positioning of the mouse cursor on the screen; the problem is that they don't – the cursor still goes well off screen.

Along with the mouse come four software packages: a hi-res graphics designer, and both sprite and icon designers. The final piece of software is not really a package, it is the control software to let you build mouse routines into your own software. Of the three packages, the hi-res designer is the most interesting. It allows the user to draw lines, circles, fill shapes, change foreground and background colours etc. The package itself is fun to use, though there are some faults. Exact positioning of the mouse is difficult thus joining lines for filling is a little hit and miss.

Filling shapes has always fascinated me, so one of the first things I did was to draw the most complicated shape I could think of. Filling the inside of this shape was a marvel to watch. Although slow, it did do a perfect fill. Problems do arise if you get lots of colours on the screen at the same time and then try a fill. The result is very similar to the effect on the Spectrum where colours go into a stair pattern. This is due to the fact that the 64 will not allow more than three colours to occupy the same block of 4*8 pixels at the same time. All that is required is a little care when choosing colours that are to be next to each other.

The icon and sprite designers are very similar in operation, with the same screen layout. Positioning the mouse is not so much of a problem in this case as the cursor always goes to the nearest point on the enlarged pixel layout. All three packages were well designed and easy to use.

The Koala Pad

The Koala pad is a touch-sensitive pad, and a peripheral not often seen on micros, as they are normally only found on expensive computer aided design (CAD) systems. They offer, as does this one, a big advantage to the user over joysticks, lightpens and mice. This is that the user actually draws on a flat horizontal surface, in much the same way as with paper and pen. The mouse is the only thing that comes close, but the unnatural feel takes some getting used to.

As with all the peripherals in this article, the touch pad includes a graphics package. This is quite similar to that of the mouse, but of a higher quality. Positioning of the cursor on the screen is much easier as only the hand and eye are used as opposed to the hand, eye and mechanics of the other devices. In fact you can actually trace the image with your finger or with a purpose-built stylus.

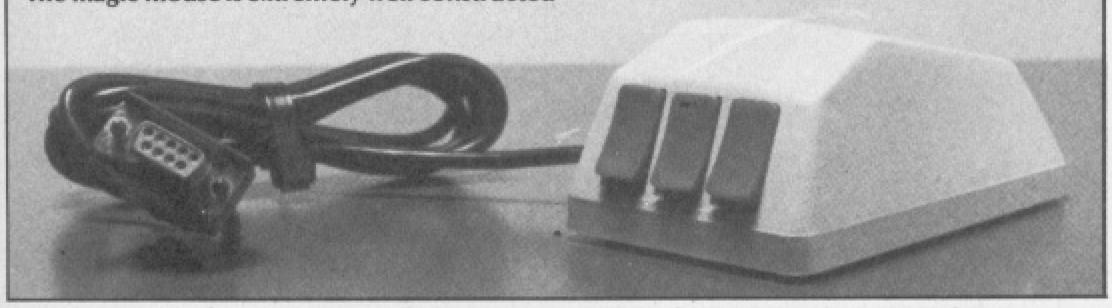
The graphics features include line, box, circle, rays, as does the mouse software. Additional features available are mirror imaging, where anything drawn is mirrored in the other three corners of the

screen. Zoom, where a portion of the screen is enlarged for fine work. Copying and swapping of various parts of the screen to another. An option called oops which negates the operation performed by the previous command.

Finally, shaded colours are available, where the normal colour is cross hatched with the current background colour. There are actually two graphics screens available and the command swap allows the user to alternate between the two. The other command that utilises both screens is the copy command. This allows you to copy a portion of one screen to the other and vice versa. Thus when using the demos, there is one called VAN which is the shell of a motor van. There is also another which contains all the accessories for the van like wheels etc. By loading both these frames, one into each graphic screen the whole picture can be made up by moving parts of one to the other.

Although fill, circle, line and multiple lines are pretty standard, this software does make a rather good job of them. Line and multiple line use rubber band techniques, so that the line can be seen before it is drawn. The fill is far more efficient and a lot quicker than that with the mouse software. When circles are defined they can be moved to any part of the screen before drawing commences.

The magic mouse is extremely well constructed



Another nice feature is the input/output section of the software, this allows the swap over between disc and tape, initialisation of discs plus the loading and saving of picture files. A number of demonstration picture files are supplied on the disc all of which are high quality, but my heavy handed drawing soon destroys their good looks. One thing to look out for is the picture called Eyefull; striking is the only way to describe it.

Overall this system is a joy to use, the graphics package fast and clear, the Koala pad was simplicity itself in use though my only criticism might be that the actual touch surface could have been slightly bigger. Excellent.

The Edumate lightpen

The lightpen has always been a popular peripheral for use with graphics packages, mainly due to its cheapness and versatility. Various types are available, though all operate on basically the same principle. All use some form of photo-transistor to detect the light. Also, some form of switch is required so that the pen is only active when required. This switch can take the form of an actual switch built into the pen, touch sensitive contacts on the pen, or, as in this case, can be switched by one or more of the keys on the keyboard. The keyboard method is the most inconvenient of the three, as it requires both hands to operate.

The Edumate pen is attractively styled, with a thin burgundy pen and coiled lead. Contained in the package as well as the pen is the Peripheral Vision graphics package; designed for the pen by the same manufacturers. The package itself contains all the usual features plus a few of its own.

One of the most interesting features is the textures. For those of you who have seen the Macpaint package for the Apple Macintosh, you will have already seen this feature. Simply, instead of only being able to draw, paint and fill in onlyone colour you are able to paint with up to 35 textures. These are two colour patterns of cross hatching, bars and stripes etc and are excellent for filling and painting. They do cause a problem when in thin line mode, they cause strange dotted rather than solid lines. Thus, when using this mode, it is wise to use the more usual solid colours in the normal way.

One option which is different to the others is the fill mode, this package checks to see if the shape is closed before it attempts to fill it. If it isn't then it briefly points to the place where the gap is so that it can be repaired before retrying.

Unlike some of the packages, all options are selected on the screen, this makes it all the more a shame that there is no switch on the pen itself. This very minor problem aside, the pen is quite accurate, if rather slow when drawing. There is an option on the menu which offers a trade off between speed and accuracy. This is subdivided into five steps between accurate but slow to fast but not so accurate. A very useful feature but possibly five steps are too many, I only used the fastest and the slowest.

The demo software that comes with the pen is not part of the main graphics package. Four programs are provided; a draw routine, a disc utility, a 3D tic-tac-toe game and pen music. The draw routine is similar to the draw section of the main graphics package and is nothing special. The disc utility allows you to access the disc for a directory or to run programs. The game is slow and easy to beat, but difficulty isn't its purpose. Pen music allows you to play notes printed on the screen by touching the pen to them.

Data lightpen

As mentioned previously, all light pens work on roughly the same principle this one though offers one major advantage. Unlike most lightpens, which react to all types of light, this one is tuned so that it only reacts to the high frequency light signals that are produced by televisions and monitors. This is difficult to prove, but the pen does have an LED (light emitting diode) mounted into its case which does come on when held up to the TV screen but is normally not lit. Also, unlike the Edumate pen, this one has a switch mounted into its case.

There is also one major difference between this package and the others. The whole thing is designed as a budget system, there are no flashy boxes and manuals with this one. Even the hole for the LED looks as though it's been gouged out with a knife. The one thing that must be remembered is that even though it doesn't look like much, it doesn't therefore mean that the product itself is going to be poor. In fact the pen itself is very comfortable to use, and it's a shame that there is not more software available for use with it.

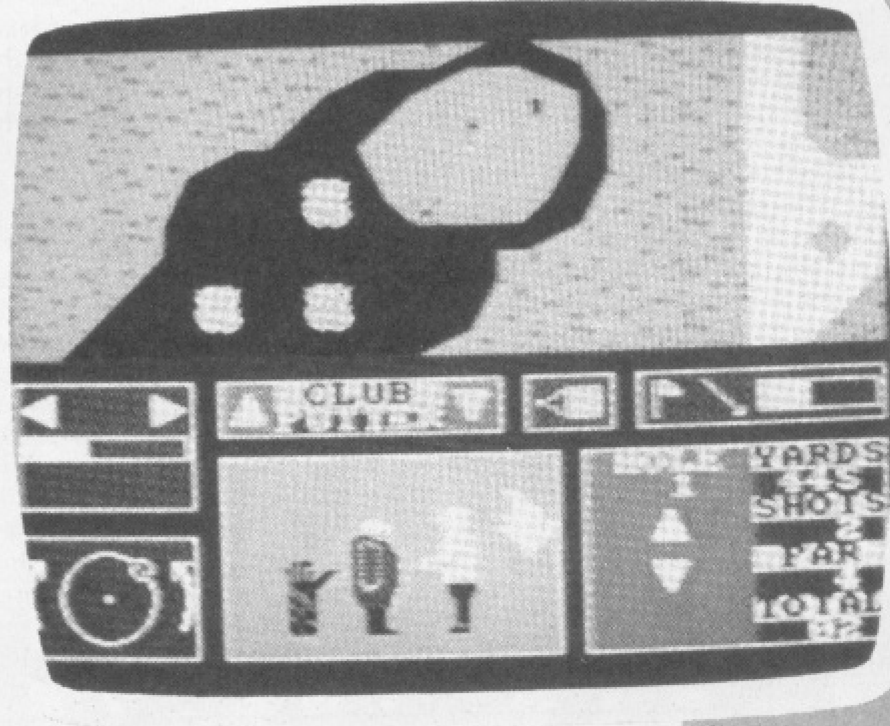
The software that does come with the pen is pretty basic, the first is an intro package which lets you know what the pen is and how it works. This is done by displaying the status of the LED, the status of the switch, and the coordinates of the pen on the screen. Finally, it lets you drag eight different coloured sprites around the screen, just for fun.

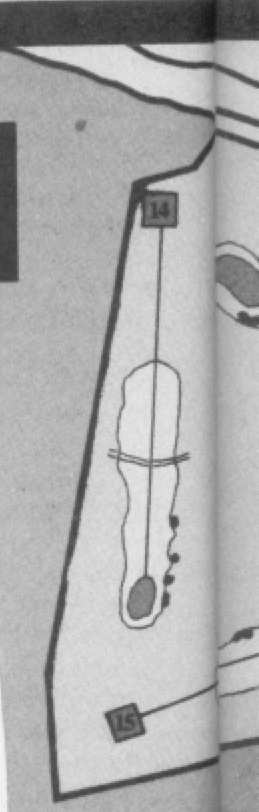
The second program on the tape is called Colour draw and is not up to much; drawing is limited to the large, cursor sized blocks. The accuracy of the pen is poor here, with the cursor being about three blocks away from the pen. Also the response to the button is very slow.

The final program is the high resolution drawing package. I was quite looking forward to trying this one after seeing the accuracy of the previous software. The software offers the following drawing modes; line, dot, turtle, continuous, and erase. The problem was that only dot mode could be accessed and this was widely inaccurate. From the instructions, it should have been possible to swap modes by using the pen, no chance. As you will have gathered, the demo software provided with the pen was not of a high standard. The important thing here though, is that all the pen control routines are available to the user for them to build into their own programs.

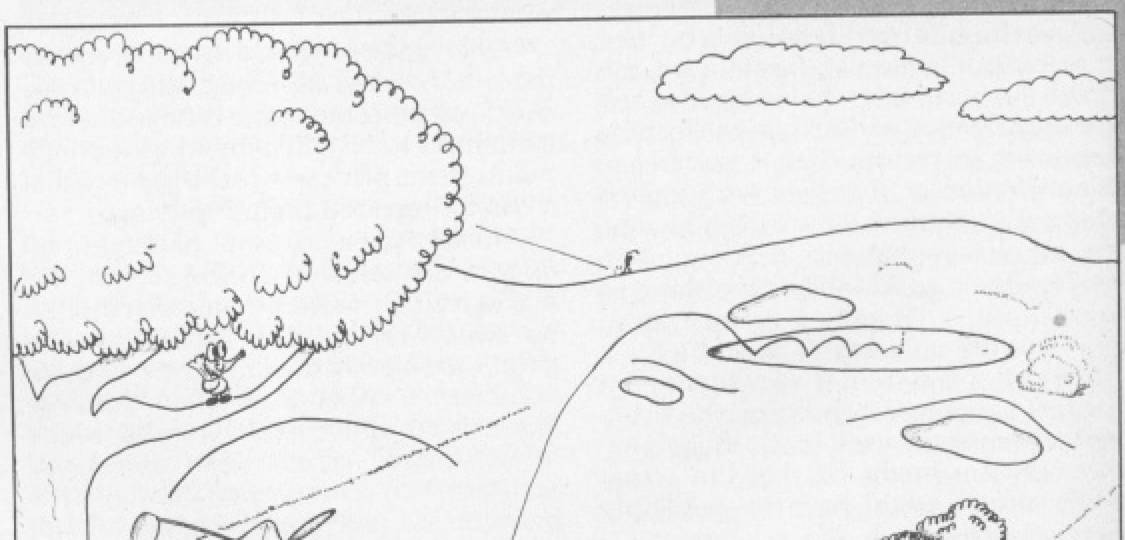
COMPETITION

Polish up your clubs for our armchair golfers competition.





Prince's Golf Links



IF YOU'VE ALWAYS THOUGHT THAT golf was not the game for you – all that getting stuck in bunkers and looking for lost balls – then think again. You can now sit comfortably in your own home and let your C64 do all the hard work for you.

Mind Games' latest release, Nick Faldo's Open, is the prize we're offering in this month's competition. The game would set you back £9.99 of your hard-earned pocket money if you went out and bought it so it's well worth the effort of entering our super easy competition.

We've got 50 copies of the game to set you on the path to golfing super stardom so we're going to make a lot of readers very happy.

The new APS game is based around the British Open Golf Championship, which was held at Sandwich in Kent this year, and the course is reproduced in the game.

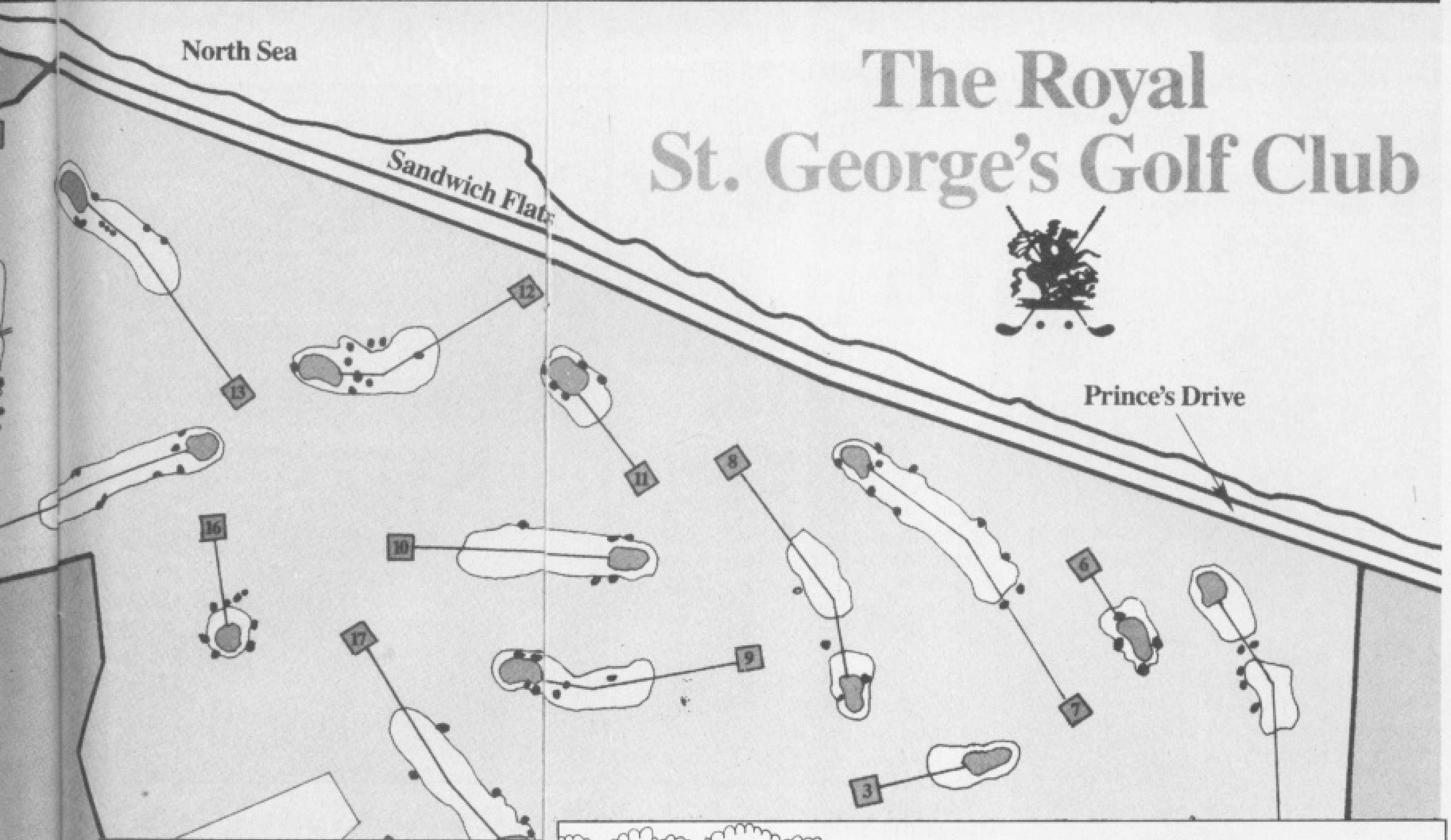
Playing the game is very realistic. You can choose which club to use and take your pick out of different ones. You must then decide on the angle of your shot and also on the strength. This is when the fun starts. If you hit it too hard you can end up with all sorts of problems. There's a very helpful little caddy who passes you your clubs and gives you advice if he thinks you've picked the wrong one but he's also very quick to make snide comments about your play if he thinks you're not up to Open standard.

You can also view the whole course from above to find out exactly where you are and how difficult it's going to be to get back to the green.

There is a detailed instruction booklet which explains such complicated points as the scoring system. It also gives particulars about the different types of clubs so you should be able to pick the right one when the time comes.

So if you want to sit in your own home playing this energetic sports game, read on for details of how to enter.

The Royal St. George's Golf Club



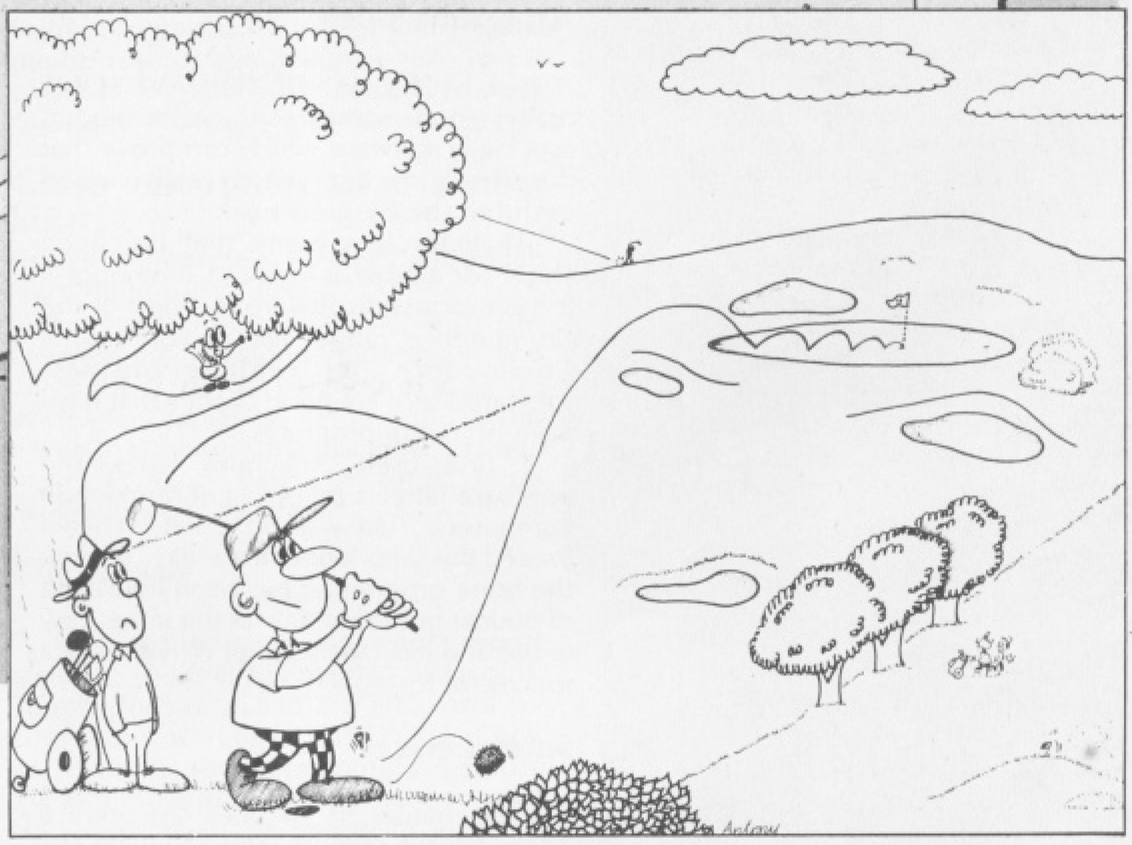
How to enter

Study the two cartoons – there are a number of differences between them. Circle the differences on the cartoon attached to the coupon. Fill in the coupon clearly and fully and seal the cartoon and coupon in an envelope. Write clearly the number of differences you found on the back of your envelope.

Post your entry to: Nick Faldo Competition, Your Commodore, No 1 Golden Square, London W1R 3AB. Closing date is first post on Friday, 27 September, 1985.

You may enter as many times as you wish but each entry must be on an official coupon – not a copy – and sealed in a separate envelope.

Important: please follow closely the guidelines on entering – incomplete coupons and entries with no numbers on the back cannot be considered. If you are a winner, the coupon will act as a label for your prize so clear writing is essential.



The rules

Entries will not be accepted from Employees of Argus Press Software, Argus Specialist Publications and Alabaster Passmore and Sons. This restriction also applies to employees' families and agents of the companies.

The How to enter section forms part of the rules. The Editor's decision is final and no correspondence will be entered into.

Name ....

Address ....

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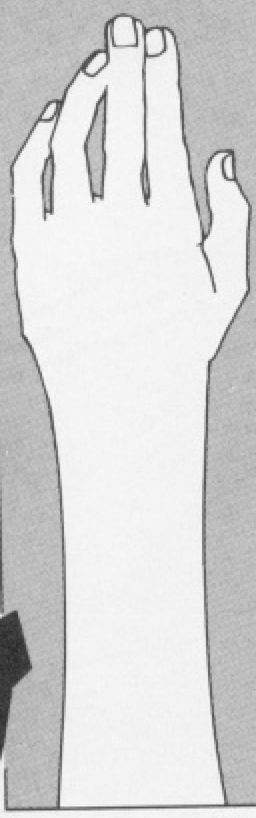
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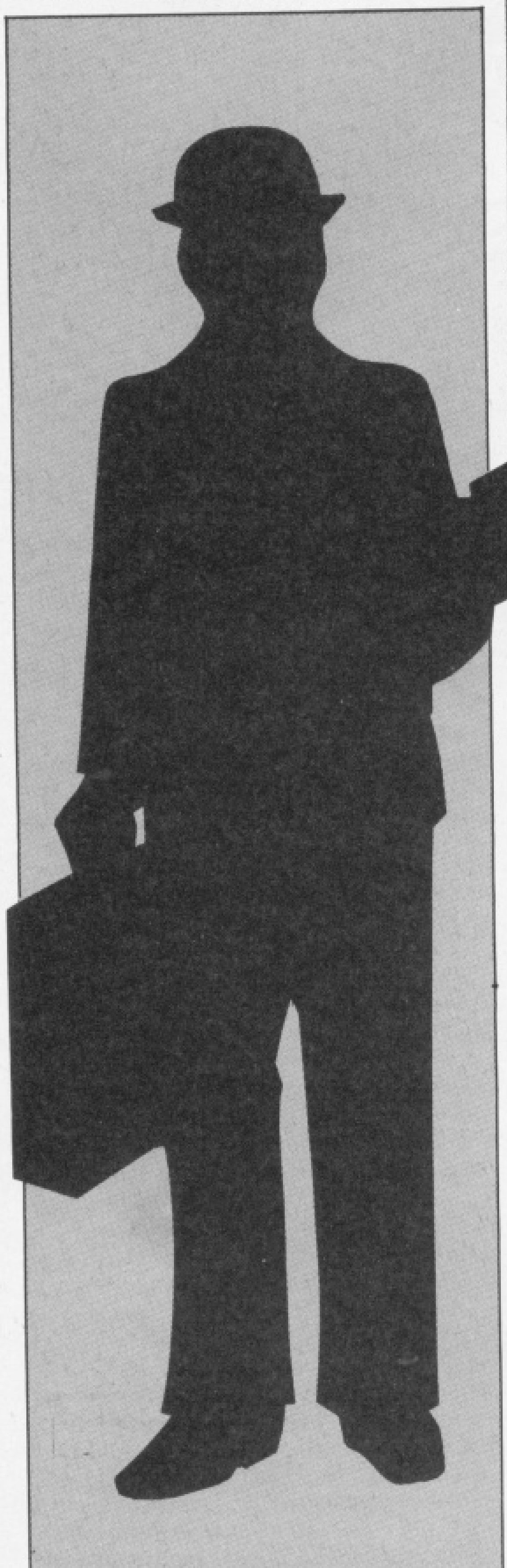
Send to: Nick Faldo Competition, Your Commodore, No 1 Golden Square, London W1R 3AB. Write clearly and fully and don't forget to put the number of differences you found on the back of your envelope.

Dave Crisp investigates more programs that will tidy up your business.

BUSINESS

BUSINESS FILE BUSINESS FILE





Anagram Sales

IT IS A NICE CHANGE TO HAVE SOME really good software to write about, especially software which can prove that the 64 is a machine which really can be useful to the business man.

Anagram is a name that has been about for almost as long as Commodore. It has produced software for most of the Commodore range and if you find a Commodore pet running business software there is a good chance that it wil have Anagram programs.

I first used Anagrams sales and purchase ledgers before I got hooked on computers. That was on a Pet. When I loaded this sales ledger it was like running the same program. It has been improved of course but the style was the same. Easy to use and hard to mess up. Why change a successful formula.

Sales Ledger

The mechanics of all sales ledgers are essentially the same. Running a ledger can appear very easy or nearly impossible. Anagram make it almost as easy as it could be for a non-bookkeeper. It would still help things if you read a book such as BOOKKEEPING MADE SIMPLE but it is by no means vital. The Anagram manuals are easy to read and go through the whole process step by step.

Capacity

If you are thinking of running a sales ledger the first thing you must be very careful and realistic about is capacity. On more than one occasion I have seen people stuck by underestimating the number of accounts they have or the number of outstanding invoices the average account has. Look into the future, think about expansion and prepare.

As a guideline Anagram offer realistic and accurate maximums. 220 customers with 13 invoices outstanding (max) without settlement discounts.
220 customers with 8 invoices outstanding (max) with settlement discounts.
110 customers with 25 invoices outstanding (max) without settlement discounts.
110 customers with 16 invoices outstanding (max) with settlement discounts.

This should be adequate for many businesses.

To quote the manual. Trade discounts, either line by line and/or across the invoice as a whole, are allowed for and provision is also made for settlement discounts. An invoice may be of up to 20 lines. Cash is posted to customer accounts, and a suspense account provides for cash which is received but cannot be allocated. The reason I have quoted the manual on that is because they have described it in the best way possible.

Hardcopy/Reports

Again to quote the book the reports obtainable are

CUSTOMER NAMES/ADDRESSES
SALES LIST
AGED DEBTORS

CURRENT CUSTOMER BALANCES
PAYMENTS AND DISCOUNTS TAKEN
SUSPENSE ACCOUNT LISTING

There is little that can be said about sales ledgers without waffleing on about what they should do and where they should be used. Anagram Sales Ledger is a very good program and very professional.

It has been used successfully on the 64 by many businesses and has a pedigree that few other programs can claim.

I have looked long and hard at many sales legers in order to operate one myself. I now use this one. It has not let me down. And certainly makes my accounts intelligable to the accountant and I think will pay for itself.

Good one Anagram.

Electronic Files

PFS FILE is a database program. Not in the same league as Superbase or Vizastar, but not as simple as the Gemini type. It falls midway between both. I tell a lie. It only falls between the two with the addition of PFS REPORT but more on that later.

Create

PFS FILE allows you to create a card index type record by moving the cursor around the screen while typing in field headings. An unusual feature of this is that each 'card' can contain up to 32 'cards'. For those with verbal diarrhoea this should allow them to squeeze everything in.

Once your card is designed you can save the template ready for filling in.

Because of the structure of the program and its use of ramdom filing it is only possible to have one created database per disc.

Depending on what you want the file for this could be either good or bad. I find that 1 file per disc saves confusion.

Forget a field?

If after using your file for a while you decide you need to add an extra field or somehow make slight modifications to the file this is quite simply done providing you have used less than 50% of the disc. This is a nice touch as it is often only after some use that you find you need an extra field for the odd comment.

I was quite disappointed to find that files created by PFS file could not be transported to wordprocessors. At least if they can be it was not in the book. This is a definate restriction as I find that one of my most common uses for a database is to create a mailing list.

Hardcopy

To printout the information you have in your database you can design a print template. You can choose which fields are to be printed and they can be printed with or without the heading. You can only print out fields in the order in which they appear on the file, although in most cases this is not an inconvenience.

Searches can be made on either the keyfield or each field. The manual says that searches on the keyfield take about 5 seconds. I found that a little optimistic but on the whole times were reasonably quick. Searches on the main body of the file was a very different story and seemed to take forever.

Records can be sorted on any field and can also be printed according to the sort.

Pfs report

Then came PFS REPORT. Its sister program. This claims to be the piece of software that makes PFS FILE complete. In my opinion this is the piece of software that was missing in the firstplace and should have been part of the first program.

At its simplest PFS REPORT allows more versatility in printing out your files. Quite complex designs can be built up even tabular reports can be printed.

The main benefit though with PFS REPORT is its facilities to calculate. Running totals can be kept and printed midform throughout a print run. This is particularly useful with file such as stock cards and records of payments/recipts.

Close encounter of a similar kind

Its style is the same as PFS REPORTS and so learning to use it is easy.

Comprehensive research and sort facilities are provided once again and criteria for printing/sorting is adequately explained in the manual. This program is the one that turns the database from a static database to a semi-programmable database.

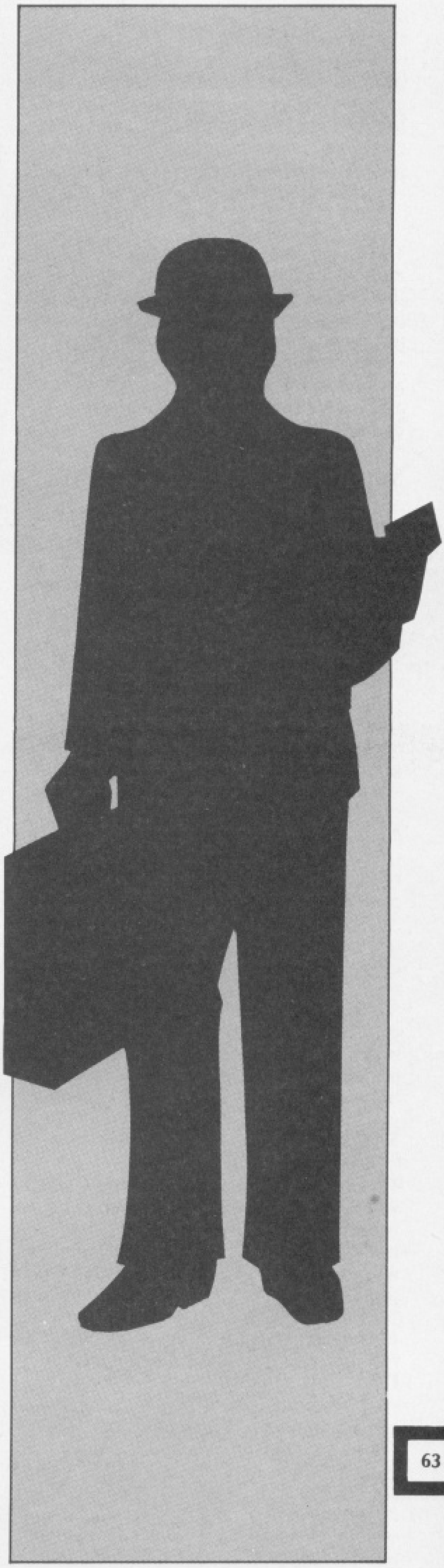
Big moans

If while you are using your report program you feel you need to add a card. Tough. Turn off. Load PFS FILE. Add record. Turn off. Load PFS REPORT. Carry on with what you were doing. In practice it is as tedious as it sounds. There could at least have been an option to load the other program from within its opposite number. A grave ommison and one which would have made it far more versatile.

How do they rate?

On the whole then not so good. Very professionally presented and would have seemed very good if it had been released about six months after the 64 was released but now gives the impression of being a little dated and tired.

5 out of 10

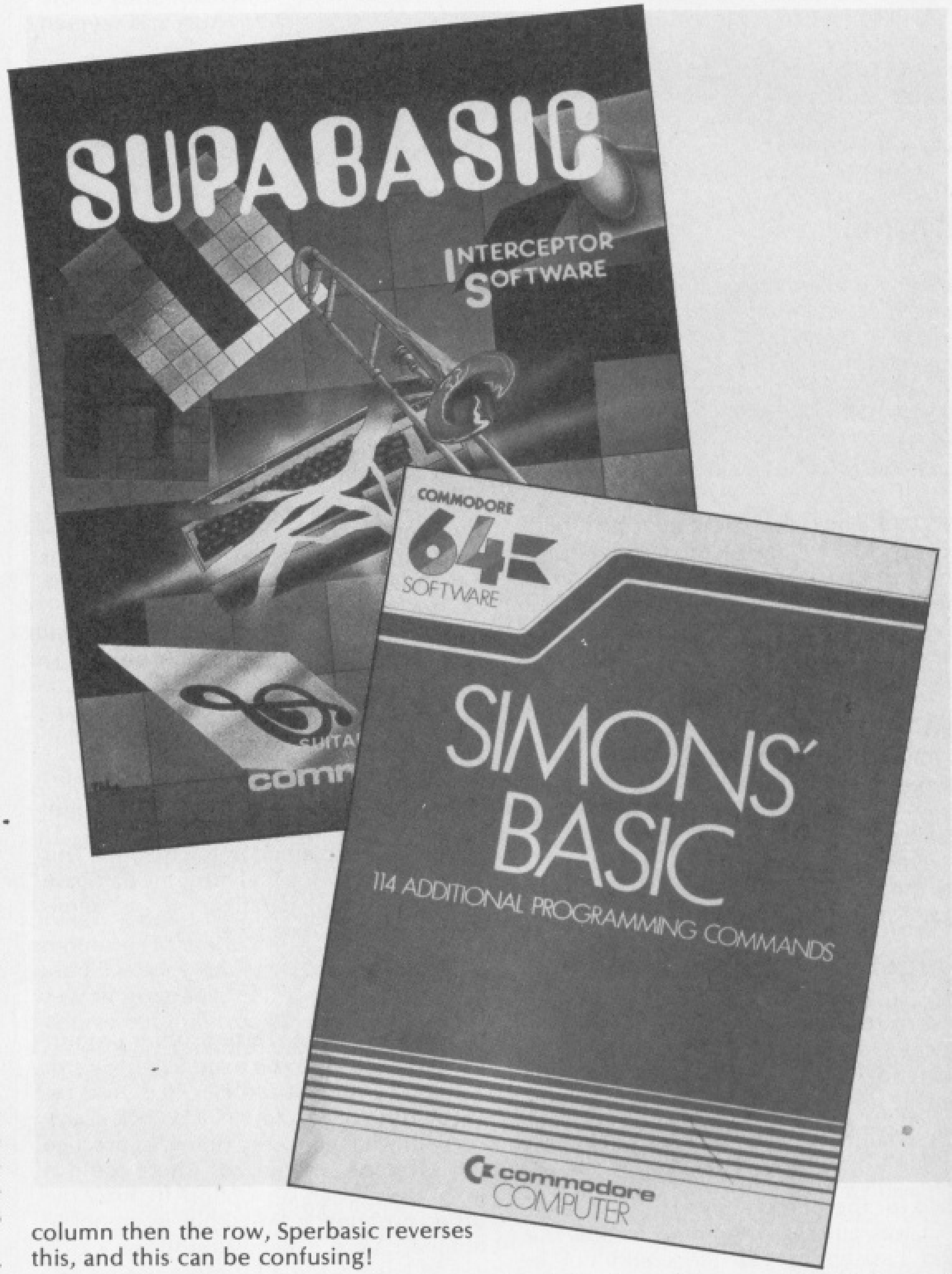


In the second and final part of our series, David Janda looks at some more extensions for your 64.

BASIC EXTENSIONS

THIS MONTH I'VE LOOKED AT another four Basic extensions for the C64. Just like last month, the variety and quality is mixed, with each package offering its good and sometimes very bad points.

Each review focuses on one particular aspect of the package which stands out, and a table listing another area of interest can also be found.



Superbasic

This package from Interceptor Micro's is rather unsusual It offers the programmer 72 commands and functions, many of which are unique to Superbasic, yet it lacks features you would expect from a Basic extension.

Superbasic is supplied on tape or disc with a 39 page manual and demonstration program. For the purpose of this review I used the tape version.

The commands and functions cover graphics, sound, programming aiods, sprites, I/O, numeric and string functions, memory manipulation and screen control. The syntax used for each command is simple and easy to remember, and getting to grips with the package was very easy.

As mentioned, the package is a little unusual and I'll concentrate on the graphics commands to illustrate this (see table 1). Worthy of particular note are the SHAPE and DRAW commands. SHAPE is used to specify a pre-defined shape which is defined in by a string of digits. Each digit performs a different action, and this is best illustrated with an example.

```
SHAPE 40, 35,1, 10, "1357"
```

This will draw a square at position 40,35 in white (colour 1). Each side of the shape will be 10 pixels in length, and the shape itself is defined by the string '1357'. One will draw up, threee will draw right, five to the left and so on.

The DRAW command is also pretty useful. Unlike many Basic extensions that require two sets of co-ordinates in a DRAW statement, Superbasic simply requires one. The result is that a line will be drawn from the last graphics origin. The origin can be moved by one of the graphic commands or invisibly by using the MOVE command.

What is not so useful is the co-ordinate system used by Superbasic. Unlike the majority of packages which specify the column then the row, Sperbasic reverses this, and this can be confusing!

Simon's BASIC

This is the package that probably set off the trend in Basic Extensions for the 64. Simons' Basic was written by thirteen year old David Simon. Commodore was so impressed with the efforts of this young man, that it was marketed by the company in cartridge form.

Since the first version, Simons' Basic has had a few modifications and buggettes removed, but it is basically the same. Unlike most extensions the 114 commands emphasise programming aids (see table 2) and structured programming rather than graphics. Graphic, sound and sprite commands are incorporated, and in a very good manner, but the structured programming side is worth looking at here.

The IF...THEN..ELSE construct is

implemented and expands on the IF..THEN by allowing program flow to branch to a second instruction if the IF test is false. Unlike standard Basic, it is necessary to precede and follow the ELSE with a colon.

RCOMP is one of the 'weird' commands contained in Simons' Basic. Its function is to re-execute the test condition of the last IF..THEN..ELSE. The example in the manual best illustrates this:

```
10 INPUT A
20 IF A=10 THEN PRINT "HELLO"; :ELSE: "BYE";
30 RCOMP: PRINT "MIKE"; :ELSE: PRINT "STRANGER";
40 RCOMP: PRINT "WELCOME" : ELSE: PRINT "SEE YOU AGAIN I HOPE"
50 GOTO 10
```

Not a command that you're going to use every day!

Two new loop structures have been added, namely REPEAT..UNTIL and LOOP..EXIT IF..END LOOP. The REPEAT..UNTIL construct (which is part of the Pascal programming language) will cause a block of lines to be repeated until a condition is met. The second type of loop is similar except it allows more than one exit condition to be placed anywhere within the program block. Very handy, but not very structured!

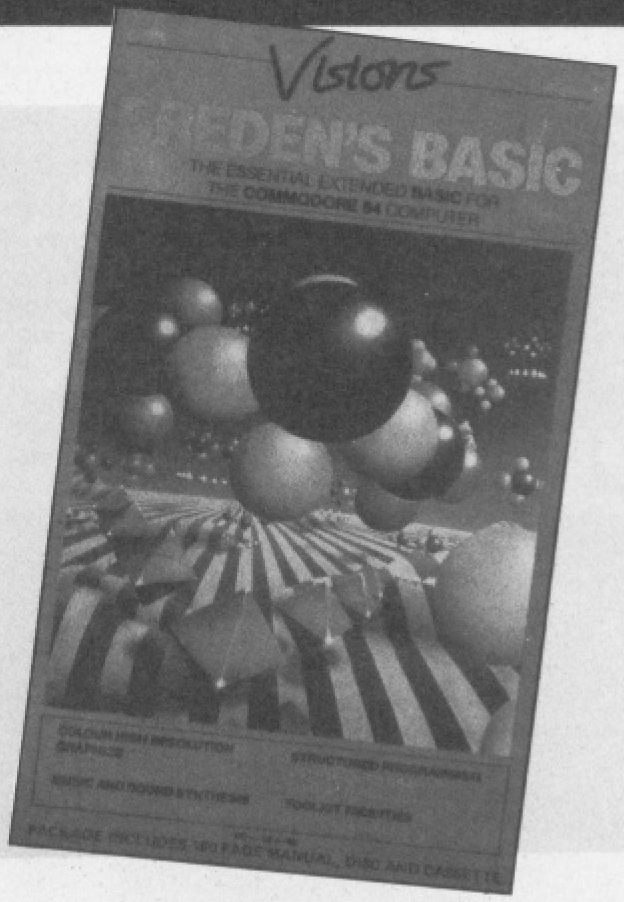
Finally, a form of procedure is included. A Simons' Basic procedure is a group of lines enclosed by a PROC name and END PROC. The named procedure can be executed by using CALL name, which will jump to the procedure (a la GOTO), or by EXEC name, which will return control to the next line (a la GOSUB). Simons' Basic doesn't cater for parameter passing, which is a pity, as it does have a crude implementation of local and global variables.

Breden's Basic

This package is very professionally presented in a metal-ring binder and an excellent 160 page cross-referenced manual. The software itself is available on tape, disc or cartridge, and contains over 130 commands and functions. The areas covered include; sprites, graphics, sound, I/O, numeric, error trapping, programming aids and so on.

The package is quite complex to use and I wouldn't recommend it to a beginner. Unfortunately, the syntax used for the commands is quite short, and thus makes remembering the commands and functions a little difficult.

The main feature of this package is the graphics/sprite handling – almost everything you could need is there. Breden's Basic does include other interesting features such as a comprehensive set of mathematical functions (see table 3).



Eleven sprite commands allow for the definition and manipulation of sprites. A sprite shape in Breden's Basic is defined with the MOBSLOT command which stores the shape of a MOB into one of the 16 slots. There are no special utilities to facilitate sprite design, and users are referred to the sprite editor from Visions!

It is possible to enable, disable, set colour, expand and alter priority of a MOB with individual commands. It is also possible to do the same thing with just one command – SETMOB. This has 10 parameters, and if used correctly can save on program space.

Table 1 — Superbasic graphic commands

Command	Description
HIRES b,c	initialises high-resolution screen including border 'b' and background 'c' colours
GRAPH	displays the high-resolution screen
TEXT	enters the text mode
WINDOW h	creates text window at bottom of high-resolution screen with height (in pixels) of 'h'
PLOT y,x,c	plot a point on high-res screen at row 'y', column 'x' and in colour 'c'
MODE m	changes effect of plot i.e. plot, erase, invert etc.
DRAW y,x,c	draw a line from current graphics cursor position to row 'y", column 'x' and in colour 'c'
MOVE y,x	move the graphics cursor to y,x without plotting a point
CHAR y,x,s,c,a	display a text string 's' in high-res mode at y,x in colour 'c' using character set 'a'
SHAPE y,x,c,s,d	plot a pre-defined shape at y,x in colour 'c'. Each side has a height of 's', and a string of digits 'd' is used to define plotting action
POINT y,x	function which returns status or pixel at y,x
PAPER c	changes background colour for high-res mode
ALTER c1,c2	change all points of colour 'c1' to colour 'c2'
SCREEN	either saves or loads a high-res screen
BLANK n	used to turn off or on the screen display. This will slightly speed up a program.

Moving a MOB about the screen in a straight line is possible with the MOVEMOB command, but if curve movements are required it is necessary to revert back to using the good old FOR. . .NEXT loops.

Collision detection between screen information or another MOB is catered for, and in all the sprite handling capabilities of this package are very good.

Video Basic-64

Video Basic-64 is by far the best Basic Extension I have used on the C64. The reasons for this are numerous, but take it from me, it is a very professional package!

The whole of Video Basic-64 is geared towards graphics in a big way. The package only offers about 50 commands, but the way they are implemented makes them very powerful.

The average Basic extension will dedicate a command to perform some function that the VIC or SID chip performs. Video Basic-64 differs insofar as each command performs a useful, effective process. What's more, the majority of commands can be used in a simple or more complex manner, it all depends on the number of parameters you wish to specify.

As mentioned, Video Basic-64 is geared towards creating graphic programs. The program wedges itself into Basic thus allowing the 'ordinary' Commodore Basic to be incorporated within the source code. I say source code because it is possible to produce a stand-alone program that uses Video Basic commands without having the compiler in memory!

The package is divided into a number of sections, each of which contains a number of commands, some of these are described below.

Both the high-res and multi colour modes are supported as well as the normal text mode. Screens of both modes can be loaded or saved to tape or disc.

The DRAW, BOX, DOT and CIRCLE commands are the primary commands used for producing graphics. Each can be followed by several parameters which can set colour, plot type (invert, unplot etc.) and so on. A very versatile BLOCK command can be used to fill an area with colour or with a defined pattern.

Sprite definition and management is quite flexible. A sprite shape can be defined in binary, decimal or hexadecimal. ROTATE allows a sprite to be rotated by 90 within its slot, but besides these, and a few others, there are no fancy movement commands.

The package also incorporates turtle graphics, game control features, an extensive range of sound commands and some very sophisticated memory management commands that allow areas of screens to be swapped, inverted and so on.

Table 2 — Simons' Basic programming aids

Command	Description
KEY n,s	assign string 's' of commands to function key n
DISPLAY	lists commands assigned to function keys
AUTO s,i	generate line numbers from line 's' in increments of 'i'
RENUMBER s,i	renumber program lines from 's' with increment 'i'
PAUSE s,n	halt program for 'n' seconds and display optional string 's'
CGOTO e	jumps to line number which is evaluated in expression 'e'
RESET n	allows data pointer to be reset at specified line number 'n'
MERGE p,d	loads a program 'p' from device 'd' and appends to existing program in memory
PAGE n	breaks program listings into pages with 'n' lines per page
OPTION n	highlights Simons' Basic keywords in program listing if option 'n' equals 10
DELAY n	varies the scroll delay 'n' when SHIFT is pressed
FIND c	searches program for character string 'c'
TRACE n	enables program trace if 'n' is set to 10. Also allows for single steping.
RETRACE	resumes TRACE after editing a program
DUMP	displays values of variables except arrays
COLD	resets C64 to start of Simons' basic
DISAPA	indicates that following line of Basic is to be made invisible.
SECURE	hides all program lines beginning with DISAPA
OLD	reverses action of NEW

Table 3 — Breden's Basic numeric manipulation

Function	Description
PI	function which returns 3.14159265
FRAC()	function which returns fractional part of a number
MOD(v,m)	returns remainder of 'v' when divided by 'm'
DIV(v1,v2)	finds integer part of the answer when dividing v1 by v2
EXCL (v1,v2)	returns result after v1 has been ORed with v2
£% b	'b' is a string of binary digits. Can be used to convert from base two
£$ h	as above, but for hexadecimal numbers
RAD (d)	converts degrees 'd' to radians
DEF (r)	converts radians into degrees
LSB (v)	returns least significant byte of two-byte value 'v'
MSB (v)	returns most significant byte of two-byte value 'v'
TBIT (v,b)	return status of bit 'b' within a one byte value 'v'
SBIT (v,b)	set bit 'b' in value 'v'
CBIT (v,b)	clear a specific bit 'b' in byte 'v'
FBIT (v,b)	flip (invert) a bit 'b' in byte 'v'
FRAN (n)	returns a random number in floating point format between zero and value 'n'
IRAN (n)	similar to above, but returns an integer
DEEK (a)	obtains value from two-byte area of memory at address 'a'
DOKE a,v	put two-byte value in two-byte area of memory at address 'a'
PUT m,v	identical to POKE
NUMBER V	displays value in base n onto screen in decimal, binary and hexadecimal

Summary

Of the eight Basic extensions reviewed in this series, there isn't one that I could say "go out and get". The reason for this is simple. Even though the majority of Basic extensions include a common set of commands, they do tend to offer features for a particular type of user.

It is hoped that you will have gained a better understanding of what a Basic extension package can and cannot offer.

Note

David Janda is prepared to enter into correspondence on this subject through the following electronic mail services:
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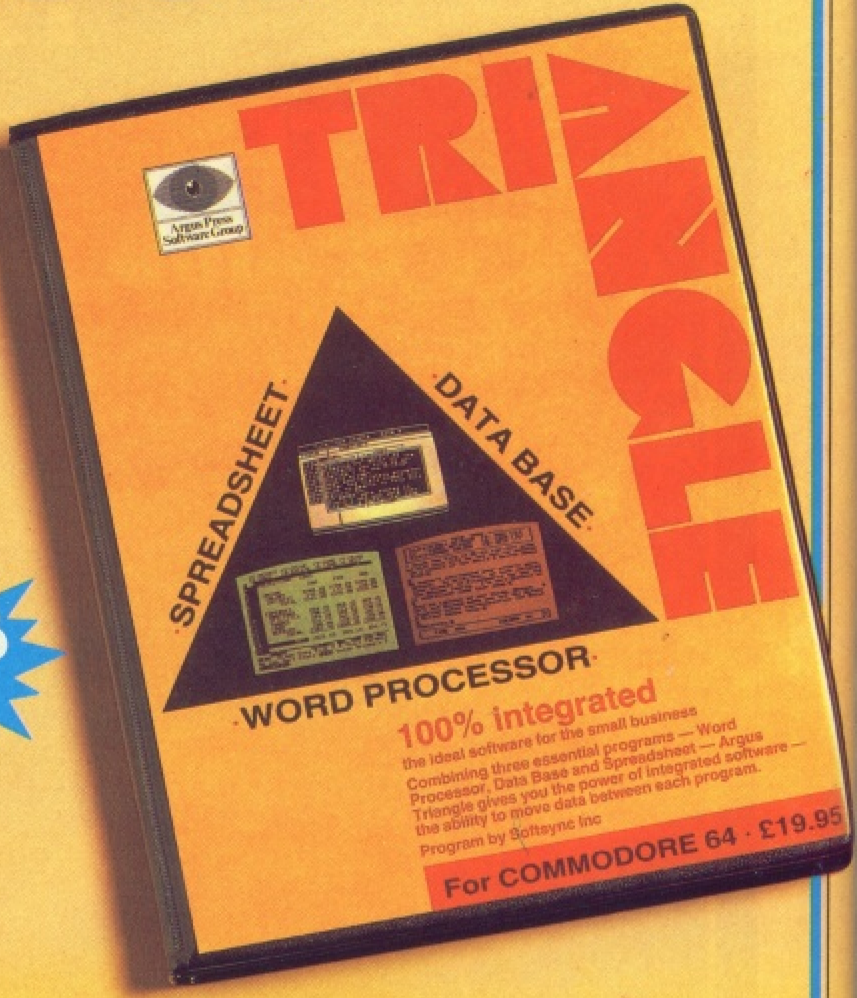
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Mike Hart produces a few more handy utilities to add to your collection.

RELIABLE ROUTINES

IT IS PROBABLY NO EXAGgeration to say that more time has been devoted to devising efficient sorting methods than to any other single problem in computing – this is not surprising in view of the fact that sorting methods are so important, particularly in commercial programming.

In general terms, the sorts that are quick and easy to code such as the (infamous) 'bubble sort' take a fairly long time to execute whilst the more efficient sorts, such as SHELLSORT and QUICKSORT achieve their speed by utilising much more complex algorithms.

In this article, I present two sorts – the first in BASIC and the second in machine code. They are both based upon the SHELLSORT method which is a reasonable compromise between speed and complexity. However most of the coding in the accompanying listing is concerned with the machine code version of the SHELLSORT about which more later.

Shellsort — BASIC version

One of the problems with sorting methods that involve string arrays is the dreaded 'garbage collection' problem in many of the CBM BASICs. This occurs when the memory becomes cluttered up with redundant strings and the computer pauses for seconds (or occasionally minutes) to clear the unwanted strings out of memory. The solution to this problem is to ensure that the string data does not actually move around in memory but stays exactly where it is. Instead, individual array elements are 'pointed to' by a pointer array and whilst it is the strings themselves that are compared is their pointers that eventually get swapped. This is the method employed in the BASIC version of the sort

Program Listing

```
SHELLSORT-M.CODE
1 REM    *** SHELLSORT-M.CODE ***
2 :
3 REM     ORIGINAL CODING FOR PET BY
4 REM DAVE BARRETT & DAVE WARDILL(1982)
5 :
6 REM ADAPTED FOR C64/VIC AND MADE
7 REM          RELOCATABLE BY
8 :
9 REM        MIKE HART (1985)
10 :
11 REM SYNTAX IS:-
12 :
13 REM SYS (LOC'N),A$(X) ...   OR
14 REM SYS (LOC'N),A(X) ...
15 REM WHERE X=START (USUALLY 1)
16 :
17 REM STRING ARRAYS WILL BE STOPPED AT
18 REM THE FIRST 'NULL' STRING ...
19 REM USEFUL TO KEEP A 'TAIL' INTACT.
20 :
21 REM FOR VIC THEN CHANGE BYTES 3,6,14
22 REM FROM 174,176,175 TO 206,208,207
23 REM CHECKSUMS IN 200-201 TO 1049,920
24 :
25 REM IN VIC OR C64 LOWER MEMORY BY
26 REM POKE 56,PEEK(56)-2:CLR
27 REM AND IN LINES 100,1040 THEN MAKE
28 REM LN=THE VALUE OF PEEK(56)*256
29 :
100 INPUT"LOCATION-TRY 50000";LN
110 IF LN=0 THEN LN=50000
120 PRINT:PRINT"READING CODE ..":PRINT
130 FOR J=LN TO LN+503 STEP 8:T=0
140 FOR K=0 TO 7:READ X:POKE J+K,X
150 T=T+X:NEXT:READ CH:IF CH=T THEN 170
160 PRINT"ERROR IN LINE"100+C:END
170 C=C+1:NEXT J:PRINT
180 :
200 DATA 32,253,174,32,139,176,165,14,985
201 DATA 240,3,76,8,175,165,13,208,888
202 DATA 4,169,5,208,2,169,3,133,693
203 DATA 251,160,4,177,95,201,1,208,1097
204 DATA 233,200,177,95,170,200,177,95,1347
205 DATA 56,229,100,133,252,133,180,138,1221
206 DATA 229,101,133,253,133,181,165,71,1266
207 DATA 133,111,165,72,133,112,165,13,904
208 DATA 240,66,169,0,133,20,133,21,782
209 DATA 168,24,177,71,240,29,165,71,945
```

presented from lines 2000 onwards. A collection of randomly generated strings has already been fed into two identical arrays, A$ and B$ in lines 1000-1080: A$ is to be used for the machine code demo and the identical array in B$ is to be used for the BASIC demo. In lines 2000-2010 a 'pointer array' is dimensioned and an index number ranging from 1 to the N of the total array size fed into it. The sort itself starts in line 3000 and has been expanded to 5 lines for readability although it can be squeezed into three. There is some pretty complex coding included here but for our purposes we might note that in line 3020 the strings 'pointed to' by the pointer array are compared whilst the swops (if necessary) are made to the pointers themselves in line 3030. There is also an interesting use of a DO-WHILE loop in the outer (A) loop which loops whilst M is greater than 0 but drops out otherwise. This actually makes the program highly efficient (for a BASIC program) as the alternative would be a GOTO statement. Loops are always more efficient than GOTOs as the addresses are held internally on the stack and line numbers do not have to be 'sought for' by the BASIC interpreter which can have a marked slowing effect, particularly if the SORT is appended to the end of a large program where there are many lines of code to be searched. This BASIC version will take about 227 seconds to sort 500 strings which is actually considerably faster than a bubble sort which could well take an hour for a sort of this magnitude.

Shellsort — machine code version

This is a very long and complex version of SHELLSORT in machine code but to some extent it is an 'all-singing all-dancing' model. It was written in 1982 by Barrett and Wardill – my own contribution to it has been to ensure that it will transfer successfully to the C64 and the VIC and also to make it completely relocateable so that it can be put into any safe area of memory.

Program Listing (cont.)

```
210 DATA 101,251,133,71,144,3,230,72,1005
211 DATA 24,230,20,208,2,230,21,166,901
212 DATA 20,228,252,144,229,166,21,228,1288
213 DATA 253,144,223,165,20,164,21,201,1191
214 DATA 2,176,5,192,0,208,1,96,680
215 DATA 165,20,166,21,133,252,133,180,1070
216 DATA 134,253,134,181,70,181,102,180,1235
217 DATA 208,82,165,181,208,58,165,13,1060
218 DATA 240,53,160,2,177,111,133,100,976
219 DATA 136,177,111,133,99,136,177,111,1080
220 DATA 168,165,111,145,99,230,99,208,1225
221 DATA 2,230,100,165,112,145,99,198,1051
222 DATA 252,208,6,165,253,240,16,198,1338
223 DATA 253,24,169,3,101,111,133,111,905
224 DATA 144,208,230,112,24,144,203,96,1161
225 DATA 165,181,133,110,165,180,133,109,1176
226 DATA 165,13,208,4,6,109,38,110,653
227 DATA 6,109,38,110,24,165,180,101,733
228 DATA 109,133,109,165,181,101,110,133,1041
229 DATA 110,176,153,165,252,56,229,180,1321
230 DATA 133,107,170,165,253,229,181,133,1371
231 DATA 108,168,165,13,208,4,6,107,779
232 DATA 38,108,6,107,38,108,138,24,567
233 DATA 101,107,133,107,152,101,108,133,942
234 DATA 108,165,111,133,99,24,101,107,848
235 DATA 133,107,165,112,133,100,101,108,959
236 DATA 133,108,165,99,133,101,165,100,1004
237 DATA 133,102,165,101,24,101,109,133,868
238 DATA 105,165,102,101,110,133,106,165,987
239 DATA 13,208,122,160,1,177,105,42,828
240 DATA 176,25,177,101,42,176,83,136,916
241 DATA 177,105,209,101,144,34,208,74,1052
242 DATA 200,192,4,48,243,16,67,176,946
243 DATA 144,144,199,177,101,42,144,16,967
244 DATA 136,177,101,209,105,144,9,208,1089
245 DATA 49,200,192,4,48,243,16,42,794
246 DATA 160,4,177,105,170,177,101,145,1039
247 DATA 105,138,145,101,136,16,243,165,1049
248 DATA 101,56,229,109,133,101,165,102,996
249 DATA 229,110,133,102,144,12,197,112,1039
250 DATA 144,8,208,150,165,101,197,111,1084
251 DATA 176,144,165,99,24,101,251,133,1093
252 DATA 99,165,100,105,0,133,100,197,899
253 DATA 108,144,174,208,170,165,99,197,1265
254 DATA 107,144,166,176,162,160,0,177,1092
255 DATA 105,209,101,144,5,24,177,101,866
256 DATA 208,2,177,105,133,29,200,177,1031
257 DATA 105,153,24,0,177,101,153,26,739
258 DATA 0,192,2,208,241,160,0,177,980
259 DATA 27,41,127,133,254,177,25,41,825
260 DATA 127,197,254,144,15,208,179,200,1324
261 DATA 198,29,48,235,160,0,177,105,950
262 DATA 209,101,176,166,160,2,16,133,963
263 :
1000 REM DEMO SORTS
1010 :
```

Program Listing (cont.)

```
1020 INPUT"HOW MANY ELEMENTS";N:PRINT
1030 J=RND(-1):REM SEED RANDOM VALUE
1040 DIM A$(N),B$(N):LN=50000
1050 FOR J=1 TO N:FOR K=1 TO 4
1060 A$(J)=A$(J)+CHR$(RND(1)*26+65)
1070 NEXT K:B$(J)=A$(J)
1080 PRINT J,A$(J):NEXT J
1090 TI$="000000":SYS LN,A$(1):T=TI/60
1100 PRINT
1110 PRINT"SORTED LIST (MACHINE CODE)"
1120 PRINT:FOR J=1 TO N:PRINT J,A$(J):NEXT
1130 PRINT
1140 PRINT"MACHINE CODE SORT TOOK"T"SECS"
1150 PRINT
1160 PRINT"..ANY KEY TO CONTINUE":PRINT
1170 GET A$:IF A$=""THEN 1170
1180 :
2000 DIM P(N):REM POINTERS FOR BASIC SORT
2010 FOR J=1 TO N:P(J)=J:NEXT J
2020 :
2030 PRINT"BASIC SORT":PRINT
2040 FOR J=1 TO N:PRINT J,B$(J):NEXT J
2050 PRINT:PRINT"NOW SORTING (BASIC).."
2060 PRINT
2070 :
2900 TI$="000000"
3000 M=N/2:FOR A=-1 TO 0:FOR J=1 TO N-M:
3010 FOR H=J TO 0 STEP-M:L=H+M:K=0
3020 F=0:IF B$(P(H))>B$(P(L))THEN F=1
3030 IF F THEN Z=P(H):P(H)=P(L):P(L)=Z:K=H
3040 H=K:NEXT:NEXT:M=INT(M/2):A=(M>0):NEXT
3050 T=TI/60
3060 :
3070 PRINT"SORTED LIST (BASIC)..":PRINT
3080 FOR J=1 TO N:PRINT J,B$(P(J)):NEXT
3090 PRINT:PRINT"BASIC SORT TOOK"T"SECS"
```

```
BASIC-FLASH
1 REM *** BASIC-FLASH ***
2 :
3 REM  **  MIKE HART  **
4 :
10 PRINT "START...":PRINT
20 A$="END OF PROGRAM :ARE YOU SURE?"
30 DL=100:GOSUB 1000
40 IF Z$<>"Y"THEN 100
50 END
100 FOR J=1 TO 10:PRINT J,J*J:NEXT
110 PRINT:GOTO 30
120 :
1000 REM FLASH S/R
1010 PRINT A$: FOR J=1 TO DL:NEXT J
1020 PRINT CHR$(145)"                              " CHR$(145)
1030 FOR J=1 TO DL:NEXT J
1040 GET Z$: IF Z$=""THEN 1000
1050 RETURN
READY.
```

As it is so long, the BASIC loader will enable a check to be made on every line of entry to help to minimise typing errors (but note here that if you get two numbers in the wrong order the checksum which is a simple addition will not generate an error but the code will not run correctly).

This sort will sort either real or string arrays (but not integers – read them into a real array if necessary). The arrays can be anywhere in memory and you can specify the starting point for the array which is usually element 1, leaving 0 for a header or a name. In the case of string arrays, the routine is designed to exit as soon as a null string is encountered – this means that you can insert a null string at a particular point to generate an exit and thus protect a 'tail' of data if this is what you want to do.

This sort is extremely fast – even for machine code. For example, it will sort 1000 strings in just over 4 seconds (whereas a comparable machine code bubble sort takes about 97 seconds). So the extra coding actually buys a big increase in speed and the flexibility to use with two types of arrays. It will not work, though, with two-dimensional arrays. In internal construction, it is not too dissimilar to the BASIC sort and itself works by manipulating pointers in the string 'headers' rather than the strings themselves – this is well explained and illustrated in the articles on machine code by A.P. & D.J. Stephenson in the June-July issues of *Your Commodore*.

Full instructions are given for adaptations for VIC-owners who will usually want to locate it at the top of memory. Try POKE 56, PEEK (56)-2:CLR in direct mode to give you 512 bytes space at the top of memory (the routine itself is 504 bytes long).

Note

In the July issue of *Your Commodore* we omitted the BASIC-FLASH listing from this article. We now print it and apologise for any inconvenience caused to our readers.

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Program Name

Computer/memory size it runs on

Amount of memory program occupies

Other computers/memory size which your program runs on without conversion or use

Does your game need or use joysticks? Yes No

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Is it original/or a variation on a theme?

Your Address

Telephone Number

Times to contact you

TOP 20 Software
Compiled by Gallup



COMMODORE 64

Title	Publisher
1 Soft Aid	Various
2 Dambusters	US Gold
3 Pitstop II	US Gold
4 International Basketball	Commodore
5 Cauldron	Palace
6 Shadowfire	Beryond
7 Theatre Europe	PSS
8 Impossible Mission	US Gold
9 World Series Baseball	Imagine
10 Kikstart	Mastertronic
11 Entombed	Ultimate
12 Air Wolf	Elite
13 Pole Position	US Gold
14 Everyone's a Wally	Mikro-Gen
15 Bruce Lee	US Gold
16 Spy Hunter	US Gold
17 Raid over Moscow	US Gold
18 Gremlins	CRL
19 Rocky Horror Show	CRL
20 Spitfire 40	Mirrorsoft

Retail sales for the week ending June 18 1985

VIC 20
Top Ten

Title	Publisher
1 RIP The Game	Mastertronic
2 Rockman	Mastertronic
3 Micky the Bricky	Firebird
4 Vegas Jackpot	Mastertronic
5 Psycho Shopper	Mastertronic
6 Hunchback	Ocean
7 Football Manager	Addictive
8 Doodlebug	Mastertronic
9 Bullet	Mastertronic
10 Perils of Wally	Software Projects

Retail sales for the week ending June 18 1985

Compiled by Gallup for the industry's weekly trade magazine, Computer and Software Retailing. For details contact John Ross, Computer and Software Retailing, 222 Regent Street, London W1R 3AB. 01-434 2131.

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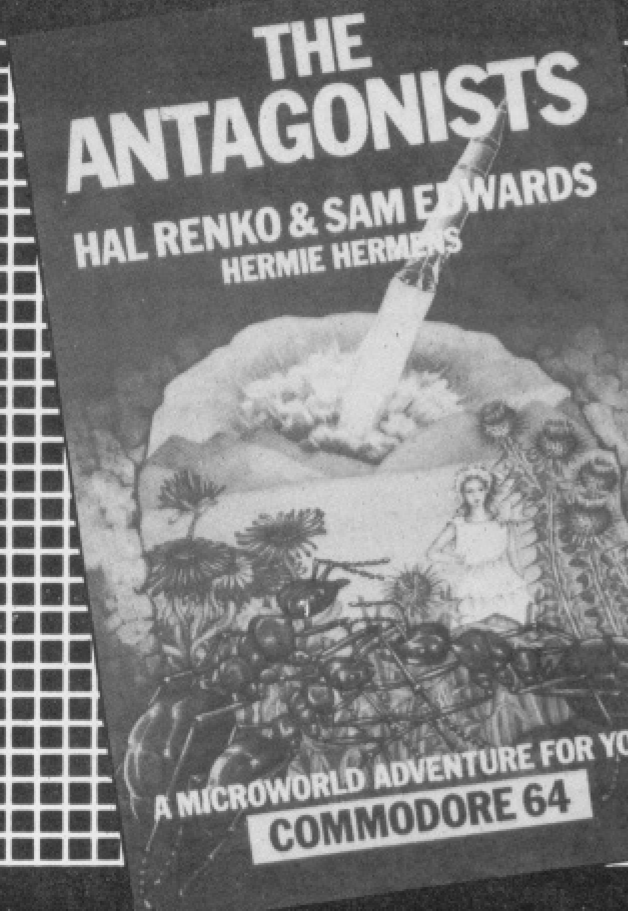
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SENSE OF ADVENTURE



SOME MONTHS AGO I COMMENTED fairly favourably on a book called 'The Secret of Arendarvon Castle' published by Addison-Wesley of Wokingham. The book contained an adventure program for you to type in, together with reams of background material to assist you in solving the adventure.

The program itself creates an adventure that is text only, takes quite some time to load, has an unusual movement control routine and does not have a particularly fast response time...but nevertheless is original in concept and well worth looking at.

Now there is another! Using a similar format 'The Antagonists' also enables you to create an interesting adventure game. The programming follows a similar pattern to 'Arendarvon Castle'. Program lines are set out in such a manner, that you start keying in on Monday and continue with daily doses, until the following Sunday. On Monday you can start playing...

The game itself is text only and uses a fairly classic VERB-NOUN or VERB-NOUN-NOUN (*unlock door with key*) input routine. Movement control uses the standard North, South, Up, Down etc. The range of commands given seems very small, so at least there should be no frustration trying to find the correct words to use.

There is no command to EXAMINE, again adding to the simplicity of 'game play'. Response to inputs is not fast but is by no means annoyingly slow.

The attraction of 'The Antagonists' apart from the simple, direct playing style, is the storyline... Again the book supplies much background material to the adventure, and is a good 'read' in its own right.

The scene is set on Earth, far in the future, with the insects having taken over from mankind, are any other humans still alive?

One man escaped (but to where?), leaving various clues behind him – can you follow him... The book has a host of intriguing and original titbits of information. Can you read between the lines and make sense of them?

The book is readily available, pick it up and have a quick browse. If you have not got time to key in the program (that is a good excuse anyway!) then a cassette of the game can be purchased from Addison Wesley.

Start them young

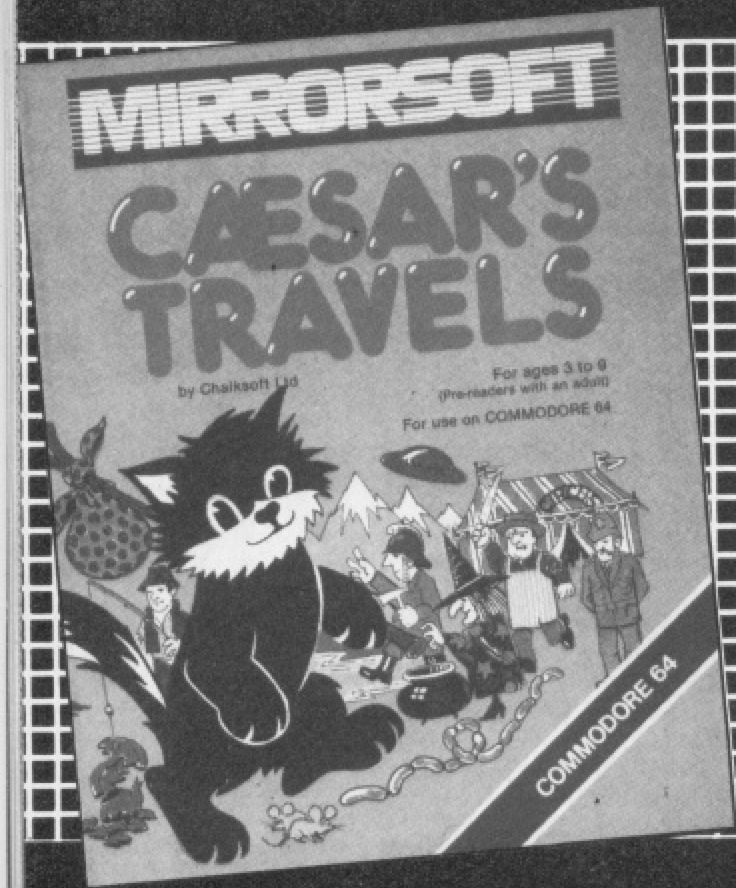
If you have young children or younger brothers or sisters, perhaps you would like to introduce them to the joys and frustrations of adventure gaming. Admittedly this could mean less time for you at the keyboard but then they may be able to help you in the future.

There are one or two programs that may serve as 'tasters' for a would-be young adventurer. Mirrorsoft has several fine educational games aimed at the very young. One is an obvious adventure primer – 'Caesar's Travels' – not so much an adventure in the sense that we normally talk about, more an interactive animated story.

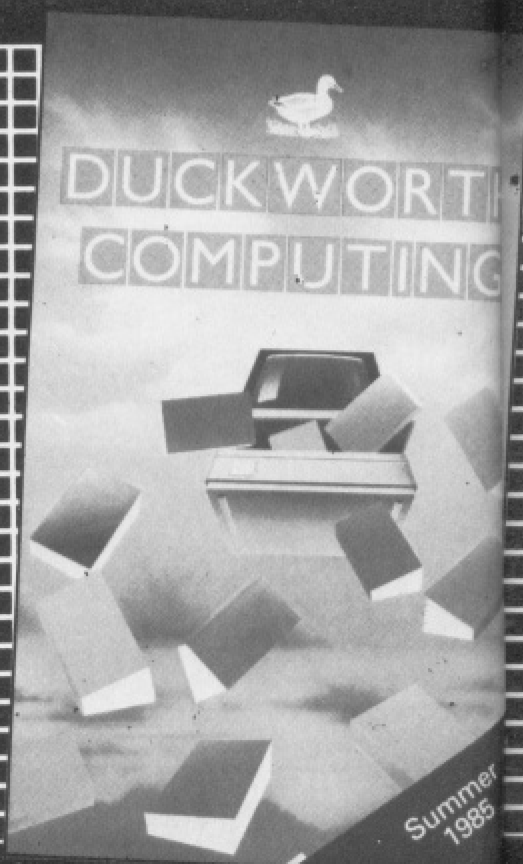
Caesar the cat first appeared as an arcade game for children, not of tremendous interest to the adult but great fun for kids. Noteworthy, was the excellent animation of Caesar himself. Caesar's Travels is a multi-choice illustrated story, with some eighteeen different endings, dependent upon the choices made as the story unfolds.

Numbers and tune recognition play a part to the story and a key card is supplied to fit over the function keys to help show the choices to be made. A book accompanies the cassette, which mimics the program – even to the choices to be made as it is read.

A true adventure aimed at the 7-14 year old is 'Super Gran – The Adventure' from Tynesoft. Written by Brian Howath and Mike Woodruff of Adventure International, based of course on the kid's







television programme of the same name.

The instructions provided are not very long but give several hints and tips that may well help the younger player (not to mention you too!). I'm not at all sure that the average seven year old could tackle this game from scratch but they would certainly make a good 'member of the team'.

The initial sequence only allows movement between two locations and offers only two objects to manipulate! Not a good start for the impatient youngster... All I will say, is – read the instructions carefully, all the hints you need to start are there!

The graphics are drawn fairly quickly and compliment the story, the input routine is similar to others used by Adventure International, with responses appearing in a scrolling text window below the picture and location description.

You may save your present position to tape for later re-loading... this is a useful ability, as there are a number of unpleasant things that can happen to Super Gran on her quest to hunt and apprehend the evil Scunner Campbell.

Both the above programs are available on the CBM 64 and have 'fast loaders'. Super Gran is also one of the few adventure programs that have been converted for the Plus 4 and the Commodore 16 (text only).

More for the Plus 4

Fed up with having to type in your own adventures on the Plus 4? Duckworth Computing have put together 'The Commodore Plus 4 Adventure Pack', on disc only at present...but it's a start! Four adventure games are included together with a copy of 'The Adventurer's Notebook' by Mike Gerrard.

The four games are all by Peter Gerrard and are: Colossal Cave, a near 'clone' of the original mainframe adventure game; True Spit, set in the wild west where you are a bounty hunter out for blood; Spaced Out, science fiction in deep space and finally; Underground Adventure, the not uncommon situation of exploring a vast network of caverns

The collection is worth the £14.95 it costs just to get a copy of the classic Colossal Cave for your Plus 4. Each adventure allows you to save your progress and position to disc at any time.

Deskbound spy...

The Fourth Protocol: The Game, is from Hutchinson Computer Publishing Ltd and is programmed by the Electronic Pencil Company. It is another of the latest flock of 'icon driven' games and is loosely based upon Frederick Forsyth's best seller of the same name.

The storyline is that there is a Russian plot to undermine the Western Alliance by the use of a nuclear device – the blame for this explosion to be put on the Americans. The subsequent political upheaval, forcing the election of a hard left government, our withdrawal from NATO and the establishment of a totalitarian state in the UK.

The game is divided into three parts, each is an independent program which has to be solved before the next may be attempted. The game starts with you playing the role of John Preston, an MI5 investigator, who, on 1st June, has just been made head of Section CI(A).

The initial game is The NATO Documents. Certain secret documents turn up amongst the haul from a robbery somewhere in England. The security services are notified and John Preston (you) is given the task of finding out who is leaking secrets, to whom and why. The answers to these questions will lead to the uncovering of the Russian plot.

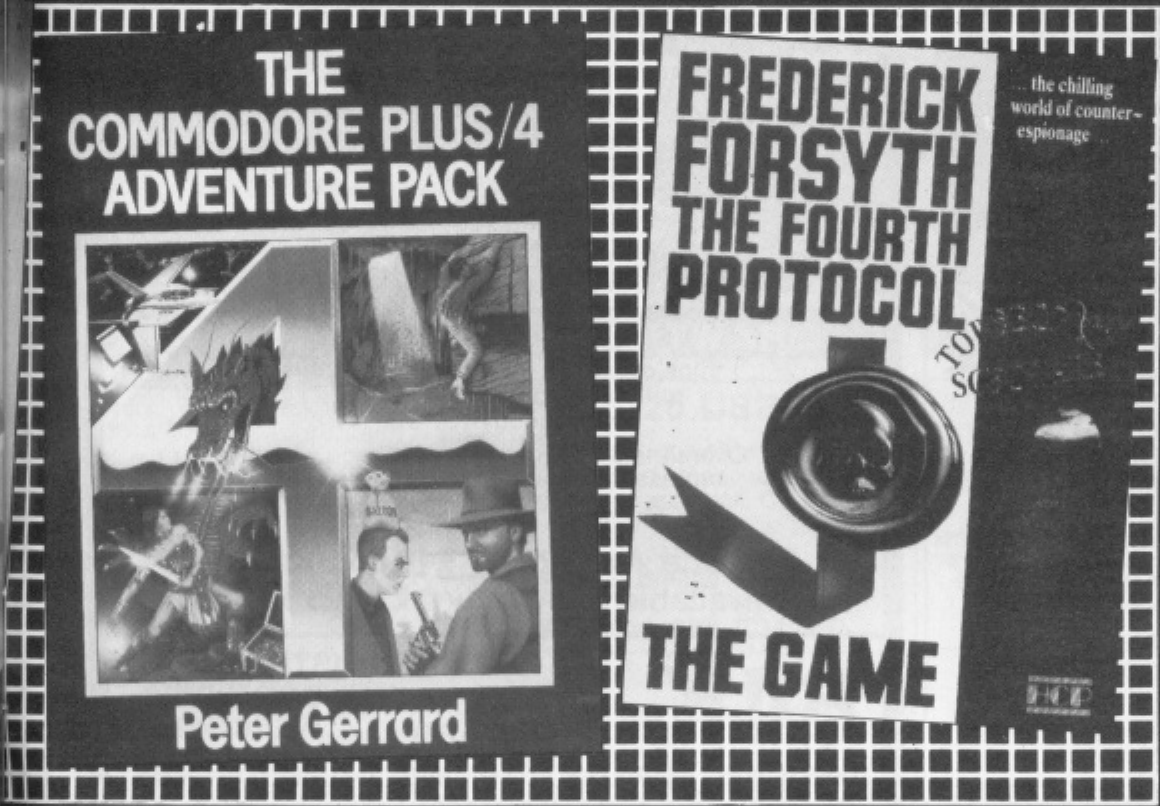
The game proceeds with you spending most of your time in your office! From here you have access to the unit's central computer (Cencom) and you will receive reports from various sources...which you will have to evaluate and act upon. Apart from the computer's files that you have access, your principle method of acquiring information is your network of 'watchers'...

You have one hundred operatives who may be 'targeted' on people that you consider may lead you towards a solution to the problems that surround you.

The screen display consists of a number of pictures (or icons...) together with a movable cursor (a pointing) hand!). Position the cursor by using the space-bar or the up/down cursor key and press RETURN to activate any particular action. This in turn produces a sub-menu (again usually pictorial) from which to choose a further relevant option.

The main menu options are:

1. Cencom Filing System, which holds files generated by the player, together with some of its own – but you have to find out what these are!
2 Surveillance, for assigning/recalling watchers to and from suspects.
3 Calendar, automatically updates throughout the game – two a half minutes roughly equal one day. The player may advance the date if required.



4 Telephone, rings if an incoming call, calls out may be made – but you have to know the number!
5 Assessment, this indicates your progress and also your prestige within MI5. If it drops too low then some facilities will be withdrawn from your control.
6 Information, three computer terminals display Memos, Reports and Situation Reports from your watchers.
7 Utilities, allows you to save and load your game position.

On receiving the various reports, memos or telephone calls, you must decide what course of action to take. Whether to assign watchers or perhaps delve into the Cencom for more information. Not all that is reported or that you have to take action upon, is relevant to the prime enquiry...what is, YOU have to find out for yourself!

Taxi...taxi!

The second section of The Fourth Protocol is also icon driven, but more closely resembles the classic format for adventure games. Move, examine, pick up, drop, inventory; are all there but because of the simplified usage brought about by the icons you do not have to think of 'how to use an object'...

You merely activate the icon for use and the program presumes the correct use...assuming of course that its use is significant at that location. The moving icons cover not only the usual four cardinal points but also stairs, doors and enable you to hail a taxi! Telephones may still be used and you also have the facility to talk directly to anyone present.

The scenario for this part of the game (The Bomb...) is that from your previous investigations you now know that a nuclear device has been smuggled into the country... you now have to find its location...fast!

Direct action

The third episode is called: The SAS Assault. You have located the bomb, the SAS are mixing it with the KGB and all you have to do is defuse the device by using the information you have gleaned in the first two parts! Instructions are typed in, in the form VERB, VERB-NOUN or VERB-ADJECTIVE-NOUN.

Whilst performing this rather delicate operation, you must also keep a weather eye open for KGB agents! If they realise what you are doing they most certainly will try to stop you. YOU must eliminate them first! You are armed, and the joystick (or cursor keys) will move an aiming 'cross-hair' around the screen. You fire using either the fire button or CTRL.

You have control...

The hallmark of a good game, arcade action or adventure, is how addictive it is and how easily the player can become 'involved' within the confines of the game's 'universe'. The Fourth Protocol has all the makings of a fine strategy/ adventure, but be warned, the clues are not all that obvious!

You should not expect to solve any game worth its salt at the first sitting, or even at the second or third. But what you should expect, is a growing awareness of the right approach. This is particularly true here, with over a dozen 'sub-plots' that although not directly leading you to the location of the nuclear device determine your effectiveness in the department. This in turn may affect the resources at your disposal.

Memos or Reports will mention places and people – you will need to remember these names in order to assign watchers. Help is at hand in the form of Cencom, not only can you read its existing files but you can also save any incoming Reports or Memos by your own file names.

Amongst other things, you will be asked to check the security of 'Building 17', on doing so you are given a map of the building and must decide where security locks are to be fitted. Do not ignore the requests...or you will be plagued by memo after memo!

Although correct action here is unlikely to help you with the major task – failure will affect your prestige...be warned, do not lock up the toilets.

Once you have read the telephone numbers in Cencom you also have access to the main security computer at Blenheim but once again you will need to know the name of a file before you can read it!

Voice analysis, one time code pads, passwords and codes, The Fourth Protocol has them all! The pressure mounts (you have until 11th July...) and the frustrating feeling that red-tape is bogging down a vital investigation overcomes you. You may be sitting behind a desk but what an exciting desk!

Having made your deductions and double checked your files, you have to report your suspicions to your superiors, get it right and you get the password to the next section. Wrong and you may as well start again!

The second part has over 150 locations for you to visit (no watchers this time!) and a number of infuriating reasons to impede your progress. Clues gleaned from the first section are followed up in your attempts to locate the bomb.

Start by examining everything so as to build up items that you may need. Not all of these are in the building you start in, so you must remember mention of other Ministry buildings in the vicinity. Find the location of the bomb (I haven't!) and once again a password allows access to the next program.

The concept of The Fourth Protocol, is really quite exciting, especially the deskbound first episode. The icons are few enough to be represented by large pictures and are therefore very clear and easily understood.

The second section is somewhat reminiscent of Melbourne House's Sherlock, I just hope it does not give me so much frustration to solve! I suspect that the third part is going to be the weakest link, but then having got that far I do not think I shall grumble too much!

The Forth Protocol: The Game, is available for the CBM 64 on fast load cassette at £12.95 and as we go to press, a disc version is in the pipeline.



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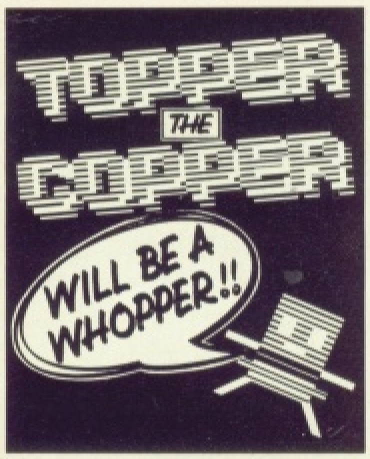
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